CHAPTER I

INTRODUCTION

Pregnancy is one of the most critical and unique period in a women’s life cycle. Due to higher nutritional requirement this group is considered too vulnerable and critical in life span (Mamta Singh et al 2009).

Pregnancy occurs as a result of the female gamete or oocyte merging with the male gamete, spermatozoon, in a process referred to, in medical science, as "fertilization," or more commonly known as "conception." After the point of "fertilization," it is referred to as an egg. The fusion of male and female gametes usually occurs through the act of sexual intercourse, resulting in spontaneous pregnancy. However, the advents of artificial insemination and in vitro fertilisation have also made achieving pregnancy possible in cases where sexual intercourse does not result in fertilization.

Most pregnant women experience a number of symptoms, such as missed menstrual period, nausea and vomiting, excessive tiredness and fatigue, craving for certain foods not normally considered a favorite, and frequent urination particularly during the night, which can signify pregnancy.

There are few complaints that may occur during pregnancy. Back pain, constipation, edema (swelling), regurgitation, heartburn, and nausea are other common complaints that may be caused by Gastroesophageal Reflux Disease (GERD); haemorrhoids, constipation, pelvic girdle pain, frequent urination, and varicose veins are other complaints experienced by some women.
Child birth is surely the greatest act performed by women. It can be a great emotional experience. The physical and psychological aspects cannot be separated. For most women, labour is a time of apprehension, of fear and agony. But, with proper antenatal preparation the majority of women can have a labour that is easy and painless or almost painless and some can actually enjoy the labour and experience a sense of fulfillment.

Pregnancy is not a disease. It is an ideal environment to give new life to the baby. At the time of pregnancy, the mother should be more positive and relaxed. Cognitive behaviour therapy helps to organize the thoughts in the positive way. In addition, yoga therapy helps to relax the mind, as well as strengthen the body.

Yoga always emphasizes on precepts like, accept life as it is, put in the best efforts wherever it is possible and then let the positive spirits overtake from the mind and it is the mind which makes or breaks a situation. The essence of harmoniously handling a glorious pregnancy lies in the ability to gain complete control over the mind, and then the body follows willingly. During the last few decades, research in yoga has proved beyond doubts that yoga helps to prevent and cure many chronic ailments. Yogic practices integrate the body, mind and spirit. They bring harmony and develop a restful and positive attitude towards life. A comprehensive programme of yogic practices designed for pregnant women will help them to have correct posture, flexibility of spine, improve their breathing capacity and to manage stress. It helps to build immunity, inner strength, improve control over body and emotions. In short it is the best preventive and curative therapy for many ailments that can occur during pregnancy. It will also ensure the baby's healthy growth.
PREGNANT WOMEN

CONCEPT AND DURATION

The duration of pregnancy is from the date of conception till the day of delivery. It is typically 38 weeks after conception. Though pregnancy begins at conception, it is more convenient to date from the first day of a woman's last menstrual period. Starting from one of these dates, the expected date of delivery can be calculated. 38 weeks is 9 months and 6 days, which forms the basis of Naegel's rule for estimating date of delivery. More accurate and sophisticated algorithms take into account other variables, such as whether this is the first or subsequent child (i.e., pregnant woman is a primiparous or a multiparous, respectively), ethnicity, parental age, length of menstrual cycle, and menstrual regularity.

Pregnancy is considered "at term" when gestation attains 37 complete weeks but is less than 42 weeks (between 259 and 294 days since LMP). Events before completion of 37 weeks (259 days) are considered pre-term; from week 42 (294 days) events are considered post-term. When a pregnancy exceeds 42 weeks (294 days), the risk of complications for the woman and the fetus increases significantly. As such, obstetricians usually prefer to induce labour, in an uncomplicated pregnancy, at some stage between 41 and 42 weeks.

Recent medical literature prefers the terminology pre-term and post-term to premature and postmature. Pre-term and post-term are unambiguous, whereas
premature and postmature have historical meaning and relate more to the infant's size and state of development rather than to the stage of pregnancy.

Accurate dating of pregnancy facilitates calculating the results of various pre-natal tests (for example, the triple test). An obstetrician may decide to induce labour if a fetus is perceived to be overdue. Furthermore, if LMP and ultrasound dating predict different respective due dates, with the latter being later, this might signify slowed fetal growth and therefore require closer review. Pregnancy ends in childbirth.

Childbirth is the process whereby an infant is born. It is considered by many to be the beginning of the infant's life, and age is defined relative to this event in most cultures.

A woman is considered to be in labour when she begins experiencing regular uterine contractions, accompanied by changes of her cervix — primarily effacement and dilation. While childbirth is widely experienced as painful, some women do report painless labours, while others find that concentrating on the birth helps to quicken labour and lessen the sensations. Most births are successful vaginal births, but sometimes complications arise and a woman may undergo a cesarean section.

During the time immediately after birth, both the mother and the baby are hormonally cued to bond, the mother through the release of oxytocin, a hormone also released during breastfeeding.

**DIAGNOSIS**
The beginning of pregnancy may be detected in a number of different ways, either by a pregnant woman without medical testing, or by using medical tests with or without the assistance of a medical professional.

A number of early medical signs are associated with pregnancy. These signs typically appear, if at all, within the first few weeks after conception. Although not all of these signs are universally present, nor are all of them diagnostic by themselves, taken together they make a presumptive diagnosis of pregnancy. These signs include the presence of human chorionic gonadotropin (hCG) in the blood and urine, missed menstrual period, implantation bleeding that occurs at implantation of the embryo in the uterus during the third or fourth week after last menstrual period, increased basal body temperature sustained for over 2 weeks after ovulation, Chadwick's sign (darkening of the cervix, vagina, and vulva), Goodell's sign (softening of the vaginal portion of the cervix), Hegar's sign (softening of the uterus isthmus), and pigmentation of linea alba - Linea nigra, (darkening of the skin in a midline of the abdomen, caused by hyperpigmentation resulting from hormonal changes, usually appearing around the middle of pregnancy).

Pregnancy detection can be accomplished using one or more of various pregnancy tests, which detect hormones generated by the newly formed placenta. Clinical blood and urine tests can detect pregnancy 12 days after implantation, which is as early as 6 to 8 days after fertilization. Blood pregnancy tests are more accurate than urine tests. Home pregnancy tests are personal urine tests, which normally cannot detect a pregnancy until at least 12 to 15 days after fertilization.
Both clinical and home tests can only detect the state of pregnancy, and cannot detect the age of the embryo.

Despite all the signs, some women may not realize they are pregnant until they are quite far along in their pregnancy, in some cases, not even until they begin labour. This can be caused by many factors, including, irregular periods (quite common in teenagers), certain medications (not related to conceiving children), and obese women who disregard their weight gain. Others may be in denial of their situation.

**PHYSIOLOGY**

Pregnancy is typically broken into three periods, or trimesters, each of about three months. These distinctions are useful in describing the changes that take place over time.

**FIRST TRIMESTER**

Traditionally, doctors have measured pregnancy from a number of convenient points, including the day of last menstruation, ovulation, fertilization, implantation and chemical detection. In medicine, pregnancy is often defined as beginning, when the developing embryo becomes implanted into the endometrial lining of a woman's uterus. In some cases, where complications arise, the fertilized egg might implant itself in the fallopian tubes or the cervix, causing an ectopic pregnancy. Most pregnant women are not aware of implantation, although it is not uncommon to experience minimal bleeding at implantation. Some women also experience cramping during their first trimester. This is usually of no concern
unless there is spotting or bleeding as well. After implantation, the uterine endometrium is called the decidua. The placenta, which is formed partly from the decidua and partly from outer layers of the embryo, is responsible for transport of nutrients and oxygen to, and removal of waste products from the fetus. The umbilical cord is the connecting cord from the embryo or fetus to the placenta. The developing embryo undergoes tremendous growth and changes during the process of fetal development.

Morning sickness occurs in about seventy percent of all pregnant women and typically improves after the first trimester. In the first 12 weeks of pregnancy the nipples and areolas darken due to a temporary increase in hormones. Most miscarriages occur during this period.

SECOND TRIMESTER

Months 4 through 6 of the pregnancy are called the second trimester. Most women feel more energized in this period, and begin to put on weight as the symptoms of morning sickness subside and eventually fade away.

In the 20th week, the uterus, the muscular organ that holds the developing fetus, can expand up to 20 times its normal size during pregnancy. Although the fetus begins moving and takes a recognizable human shape during the first trimester, it is not until the second trimester that movement of the fetus, often referred to as "quickening", can be felt. This typically happens in the fourth month, more specifically in the 20th to 21st week, or by the 19th week if the woman had been pregnant before. However, it is not uncommon for some women not to feel the fetus move until much later. The placenta fully functions at this time and the
fetus makes insulin and urinates. The reproductive organs distinguish the fetus as male or female.

THIRD TRIMESTER

During the period final weight gain takes place, which is the most weight gain throughout pregnancy. The fetus grows the most rapidly during this stage, gaining up to 28g per day. The woman's belly transforms in shape as the belly drops due to the fetus turning in a downward position ready for birth. During the second trimester, the woman's belly would have been very upright, whereas in the third trimester it drops down quite low, and the woman can be able to lift her belly up and down. The fetus begins to move regularly, and is felt by the woman. Fetal movement can become quite strong and be disruptive to the woman. The woman's will sometimes becomes convex, "popping" out, due to her expanding abdomen. This period of her pregnancy can be uncomfortable, causing symptoms like weak bladder control and back-ache. Movement of the fetus becomes stronger and more frequent. The woman can feel the fetus "rolling" and it may cause pain or discomfort when it is near the woman's ribs and spine.

It is during this time that a baby born prematurely may survive. The use of modern medical intensive care technology has greatly increased the probability of premature babies surviving, and has pushed back the boundary of viability to much earlier dates than would be possible without assistance. In spite of these developments, premature birth remains a major threat to the fetus, and may result in ill-health in later life, even if the baby survives.

PHYSICAL CHANGES IN PREGNANCY
Recent studies found that 32% of pregnant women alone gain recommended amount of weight, 21% have gained too little and 48% have gained too much of weight during pregnancy (NVSSBD, 2015) (National Vital Statistics System birth data). Gestational weight gain may influence the prevalence and severity of obesity in future generations. Pregnancy is the crucial period to make interventions and address these issues by monitoring the dietary intake and physical activities (IOM, 1990).

High Body mass index before pregnancy is associated with greater gestational weight gain (Mckeeown and Record, 1957). The combination of gestational weight gain with post-partum weight retention would have long term health issues for woman. Mostly it is associated with weight gain during first pregnancies, than the subsequent pregnancies (Billewicz, 1970).

High proportion of women reported that they were either not given advice on how much weight to gain during pregnancy or were advised to gain outside of the guidelines for their prepregnany Body mass index category (Cogswell et al, 1999; Stotland et al,2005). The data from 2002-2003 pregnancy risk assessment monitoring system show that 50-73% of women gain either below or above the guidelines for their pre-pregnancy Body mass index category (Rasmussen et al, 2009). Institute of Medicine, 1990 guidelines suggests the weight gain (15 lbs) for obese women, but no upper range. What time we measure or diagnose the gestational diabetes mellitus is important, because treatment with diet, insulin and increased physical activity may affect the subsequent weight gain during pregnancy. Higher Gestational Weight Gain (GWG) may lead to excessive postnatal weight retention, which in turn increase the risk of fetus in the
subsequent pregnancy and women’s own long-term health. The Institute of Medicine was concerned about the potential low or no gain during pregnancy, mainly focused on women with glucose intolerance, to be harmful if it was associated with fetal growth restriction or ketonemia (Rasmussen et al, 2009).

They have recommended that any weight loss issues should be attempted only during preconception or between pregnancies, not during pregnancy, in order to maintain the safety of the fetus. The IOM recommendation for weight gain is 6.8-11.3 Kg (15-25 lb) for overweight women (BMI of 25-29.9) and 5-9.1 Kg (11 to 20 lb) for all obese women. Gestational weight gain below this recommendation does not affect the fetal growth or neonatal outcomes. In several studies weight gain of 2.7-6.4 Kg (6-14 lb) of overweight women had similar fetal growth, per-natal and neonatal outcomes, and less postpartum weight retention than those who gained recommended weight during pregnancy (Langford, 2011).

Pregnant women should practice moderate-intensity physical activity, for 30 minutes a day in order to prevent excess weight gain during pregnancy. Regularly checking their weight gain from the beginning of pregnancy and also during antenatal care visits, hence any sign of inadequate or excess gestational weight gain can be identified at the early stage and appropriate steps can be taken to prevent it (Cynthia, 2014).

PHYSIOLOGICAL CHANGES IN PREGNANCY

The body must change its physiological and homeostatic mechanisms in pregnancy to ensure, increases in blood sugar, breathing and cardiac output are all required to meet the need of the fetal growth.
HORMONAL CHANGES

Levels of progesterone and estrogens rise continually throughout pregnancy, suppressing the hypothalamic axis and subsequently the menstrual cycle. The woman and the placenta also produce many hormones.

Prolactin levels increase due to maternal Pituitary gland enlargement by 50%. This mediates a change in the structure of the Mammary gland from ductal to lobular-alveolar. Parathyroid hormone is increased due to increase in calcium uptake in the gut and reabsorption by the kidney. Adrenal hormones such as cortisol and aldosterone also increase.

Placental lactogen is produced by the placenta and stimulates lipolysis and fatty acid metabolism by the woman, conserving blood glucose for use by the fetus. It can also decrease maternal tissue sensitivity to insulin, resulting in gestational diabetes.

MUSCULOSKELETAL CHANGES

The body's posture changes as the pregnancy progresses. The pelvis tilts and the back arches to help keep balance. Poor posture occurs naturally from the stretching of the woman's abdominal muscles as the fetus grows. These muscles are less able to contract and keep the lower back in proper alignment. The pregnant woman has a different pattern of gait. The step lengthens as the pregnancy progresses, due to weight gain and changes in posture. On an average, a woman's foot can grow by a half size or more during pregnancy. In addition, the increased body weight of pregnancy, fluid retention, and weight gain lowers the arches of the foot, further adding to the foot's length and width. The influences of increased
hormones such as estrogen and relaxin initiate the remodeling of soft tissues, cartilage and ligaments. Certain skeletal joints such as the symphysis pubis and sacroiliac widen or have increased laxity.

One of the most noticeable alterations in pregnancy is the gain in weight. The enlarging uterus, the growing fetus, the placenta and liquor amnii, the acquisition of fat and water retention, all contribute to this increase in weight. The weight gain varies from person to person and can be anywhere from 5 pounds (2.3 kg) to over 100 pounds (45 kg). Other physical changes during pregnancy include breasts increasing two cup sizes. Also, areas of the body such as the forehead and cheeks (known as the 'mask of pregnancy') become darker due to the increase of melanin being produced.

**CARDIOVASCULAR CHANGES**

Blood volume increases by 40% in the first two trimesters. This is due to an increase in plasma volume through increased aldosterone. Progesterone may also interact with the aldosterone receptor, thus leading to increased levels. Red blood cell numbers increase due to increased erythropoietin levels.

Cardiac function is also modified, with increased heart rate and increased stroke volume. A decrease in vagal tone and increase in sympathetic tone is the cause. Blood volume increases act to increase stroke volume of the heart via Starling's law. After pregnancy the change in stroke volume is not reversed. Cardiac output rises from 4 to 7 liters in the 2nd trimester.

Blood pressure also fluctuates. In the first trimester it falls. Initially this is due to decreased sensitivity to angiotension and vasodilation provoked by
increased blood volume. Later, however, it is caused by decreased resistance to the growing uteroplacental bed.

**RESPIRATORY CHANGES**

Decreased functional residual capacity is seen, typically falling from 1.7 to 1.35 litres, due to the compression of the diaphragm by the uterus. Tidal volume increases, from 0.45 to 0.65 litres, giving an increase in pulmonary ventilation. This is necessary to meet the increased oxygen requirement of the body, which reaches 50ml/min, 20ml of which goes to reproductive tissues.

Progesterone may act centrally on chemoreceptors to reset the set point to a lower partial pressure of carbon dioxide. This maintains an increased respiration rate even at a decreased level of carbon dioxide.

**METABOLIC CHANGES**

As there is increased requirement for nutrients, it is given by fetal growth and fat deposition. Changes are caused by steroid hormones, lactogen, and cortisol.

Maternal insulin resistance can lead to gestational diabetes. Increased liver metabolism is also seen, with increased gluconeogenesis to increase maternal glucose levels.

**RENAL CHANGES**

Renal plasma flow increases, as does aldosterone and erythropoietin production as discussed. The tubular maximum for glucose is reduced, which may precipitate gestational diabetes.

**NUTRITION**
In order to cope up with all these changes, a balanced, nutritious diet is an important aspect of a healthy pregnancy. Eating a healthy diet, balancing carbohydrates, fat, and proteins, and eating a variety of fruits and vegetables, usually ensures good nutrition. Those whose diets are affected by health issues, religious requirements, or ethical beliefs may consult a health professional for specific advice.

Adequate periconceptional folic acid (also called folate or Vitamin B9) intake has been proven to limit fetal neural tube defects, preventing spina bifida, a very serious birth defect. The neural tube develops during the first 28 days of pregnancy, explaining the necessity to guarantee adequate periconceptional folate intake. Folates (from folia, leaf) are abundant in spinach (fresh, frozen, or canned), and are also found in green vegetables, salads, citrus fruit and melon, chickpeas (i.e. in the form of hummus or falafel), and eggs.

DHA omega-3 is a major structural fatty acid in the brain and retina, and is naturally found in breast milk. It is important for a mother to consume adequate amounts of DHA during pregnancy and while nursing to support her well-being and the health of her infant. Developing infants cannot produce DHA efficiently, and must receive this vital nutrient from the mother through the placenta during pregnancy and in breast milk after birth. Several micronutrients are important for the health of the developing fetus, especially in areas of the world where insufficient nutrition is prevalent.

IMMUNE TOLERANCE
The fetus inside a mother may be viewed as an unusually successful allograft, since it genetically differs from the mother. In the same way, many cases of spontaneous abortion may be described in the same way as maternal transplant rejection.

**DRUGS IN PREGNANCY**

Drugs used during pregnancy can have temporary or permanent effects on the fetus. Therefore many physicians would prefer not to prescribe for pregnant women, the major concern being over teratogenicity of the drugs. This results in inappropriate treatment of pregnant women. Use of drugs in pregnancy is not always wrong. For example, high fever is harmful for the fetus in the early months. Use of paracetamol is better than no treatment at all. Also, diabetes mellitus during pregnancy may need intensive therapy with insulin. Hence, a cautious prescription of drugs during pregnancy is recommended.

**EXPOSURE TO TOXINS**

Various toxins pose a significant hazard to fetus during development:

Alcohol ingestion during pregnancy may cause fetal alcohol syndrome, a permanent and often devastating birth-defect syndrome. Women who have suffered mercury poisoning in pregnancy have sometimes given birth to children with serious birth defects, termed Minamata disease.

**NUTRITIONAL REQUIREMENTS DURING PREGNANCY**

**ENERGY**
The maternal diet during pregnancy must provide sufficient energy to ensure the delivery of a full-term, healthy infant of adequate size and appropriate body composition. The total energy cost of pregnancy has now been estimated at around 321 MJ (77 000 kcal). This is based on data from longitudinal studies and factorial calculations of the extra energy required during this period (FAO/WHO/UNU 2004).

**PROTEIN**

The total protein requirement during pregnancy has been estimated to be approximately 925 g for a woman gaining 12.5 kg and delivering an infant of 3.3 kg (Hytten1980). Protein is not gained at a constant rate, the rate at which protein is deposited increases as pregnancy progresses. Estimates for the first, second, third and fourth quarters are 0.64, 1.84, 4.76 and 6.10 g of protein per day, respectively (FAO/WHO/UNU 1985).

However, more recent estimates from longitudinal studies of women in developed countries (e.g. UK, USA) suggest protein gains in pregnancy may be lower, in the range of 497 to 696 g for an average weight gain of 12 kg (FAO/WHO/UNU 2004).

**LIPIDS**

No dietary reference intakes (DRIs) for total lipids during pregnancy have been established. The amount of fat in the diet should depend on energy requirements for proper weight gain (IOM 2002).

However, pregnant women and those planning a pregnancy need an adequate dietary intake of essential fatty acids and their longer-chain derivatives,
DHA and AA, which are necessary for the development of the brain and nervous system of the fetus, particularly in late pregnancy (BNF 1999). The best dietary source of long chain n-3 fatty acids (EPA and DHA) is oil-rich fish (C.S. Williamson 2006).

The Institute of medicine has established DRIs for carbohydrate intake during pregnancy. The estimated average requirement (EAR) is 135g / day, and the adequate intake (AI) is 175 g / day (IOM, 2002). the recommended amount of 135 to 175 g/d is the quantity needed to provide enough calories in the diet, to prevent ketosis, and maintain appropriate blood glucose levels during pregnancy (L. Kathleen Mahan 2004).

FETAL NUTRITION AND GROWTH

Fetal nutrition is the main regulator of fetal growth in late gestation. However the influence of maternal nutrition on fetal growth is also dependent on the relative efficiency of the fetal supply line, the timing and balance of changes in maternal nutrition, and the indirect effects of altered maternal nutrition on fetal endocrine status and substrate balance (Jane E. Harding 2001).

Cross breeding and embryo transplant experiments in a variety of animal species have clearly demonstrated that size at birth is largely determined by the maternal uterine environment, with the parental genotype having a relatively small influence (Snow MHL 1989).

Fetal growth in late gestation is normally limited by maternal size and her capacity to supply nutrients to her fetus; a phenomenon known as maternal constraint. Thus fetal growth in late gestation is normally regulated by fetal
nutrient supply (Gluckman P 1992). This principle of the nutritional regulation of fetal growth is relatively easily demonstrated in animal species. In pregnant sheep, maternal under-nutrition in late gestation results in prompt slowing of fetal growth, and fetal growth resumes with maternal re-feeding [a) Harding JE 1997, b) Harding JE 1997]. However such a relationship is more difficult to demonstrate in human pregnancy. There are case reports of women with severe under-nutrition for medical reasons resulting in impaired fetal growth which is at least partially reversed by improving maternal nutrition status (Rivera-Alsina ME 1984), (Adami GF 1992). Nevertheless, in general the relationship between maternal nutrition and fetal growth is difficult to demonstrate in human pregnancy. This difficulty in demonstrating a direct relationship between maternal nutrition and fetal growth relates largely to the very indirect relationship between maternal nutrition and fetal nutrition. The mammalian fetus grows at the end of a long and sometimes precarious “supply line”, linking maternal diet at one end with fetal tissue nutrient uptake at the other (Bloomfield FH 1998). The supply line includes maternal diet, maternal metabolism and endocrine status, uterine and umbilical blood flows and placental transfer capacity and metabolism. Relatively large changes in maternal nutrition may have little impact on fetal nutrition if the capacity of the fetal supply line allows a large margin of safety for fetal growth. Conversely, common clinical causes of impaired fetal growth in well nourished populations such as maternal hypertension associated with reduced uterine blood flow, or placental infarcts resulting in reduced placental transfer capacity, may severely limit fetal nutrient supply without a corresponding change in maternal nutrition.
The indirect relationship between maternal nutrition and fetal growth is further confused by the influence of the timing and balance of maternal nutrient intake on fetal growth. Much of the work on nutrient balance has come from human studies. Although randomized controlled trials of maternal dietary supplements have shown relatively little effect on birth weight, supplements with a relatively high proportion of calories provided as protein actually result in reduced mean birth weight (Kramer M.S 1999). Similarly, in a relatively well nourished population, the combination of high carbohydrate intake in early pregnancy and low protein intake in late pregnancy was shown to be associated with reduced birth-weight, low ponderal index and reduced placental weight (Godfrey K 1996, Godfrey KM 1997). The proportions of protein and carbohydrate in a woman’s diet in pregnancy have also been shown to influence both the placental size and the blood pressure of the adult offspring (Campbell DM 1996).

There is also increasing evidence that maternal nutrition around the time of conception is particularly critical in the regulation of fetal growth.

Maternal weight before pregnancy is an important influence on birth size in women, but it is not yet clear to what extent improved maternal nutrition in early pregnancy may influence birth size independent of nutritional status at pregnancy onset.

Although it is clear from experimental data that nutrition influences fetal growth in late gestation, the mechanisms by which this occurs are far from clear. It appears superficially logical to assume that nutrient limitation to the fetus at a given stage of development is likely to inhibit growth of organs that are growing rapidly at that time. However simple limitation of substrates to growing organs
leading to reduction in size of those organs is an inadequate explanation. For example, maternal protein restriction in pigs results in reduced fetal weight and length at mid-gestation at a time when the fetus is extremely small and fetal protein requirements for growth are unlikely to have been limiting (Pond WG 1991). Similarly, maternal under-nutrition in either early or late gestation in sheep, leading to fetal under nutrition and limited nutrient supply to growing organs (Oliver MH 2000), (Harding JE 2001).

DIETARY MODIFICATION DURING PREGNANCY

All the interventions published since 2000 have concentrated on reducing or maintaining gestational weight gain through various approaches. Some of those were counseling on diet or exercise or the combination of both, regular checking of weight gain, providing unique physical activity classes, dietary prescription by the Nutritionist and daily recording of dietary intake.

Taking balanced diet like whole grains, vegetables, fruits, low fat dairy and lean protein and avoiding food contains sugar and solid fats like soft drinks, desserts, fried foods, whole milk and fatty meats will maintain the healthy weight gain during pregnancy (IOM, 1990).

Dietary goals might be helpful to meet the additional nutritional requirement during pregnancy. Physical activity, when combined with dietary goals would be an effective strategy to prevent excessive gestational weight gain (Phelen et al, 2011).

ESSENTIALS OF PHYSICAL ACTIVITY DURING PREGNANCY
Women with a normal body mass index before pregnancy, who gain excessive weight or very little weight than the recommended weight during pregnancy, have an high level of impact on the metabolic rate of their off springs which in turn affects the appetite control and energy expenditure of the fetus, in later stages of life, leads to childhood obesity and other complications (Sneha et al, 2014). Women with excessive weight gain during pregnancy have 80 percent chance to have an obese child; women with very little weight gain have 63 percent chance to have an obese child (Sneha et al, 2014). Greater episodes of congenital abnormalities, pre-term babies, pre-eclampsia are strongly associated with obesity during pregnancy (Keith et al, 2016). Maternal obesity with greater deposition of adipose tissue within the growing fetus, increase the risk of allergies, also have an impact on fetal brain development and behavioural pattern, leads to autism and ADHD (Keith et al, 2016). The accumulation of environmental factors in egg and sperm of parents contribute a lot to the formation of genetic material to the child. Many lifestyle factors including poor and unhealthy diet, obesity, smoking, drinking and also the age of the parents have an influence on transmitting the signals to the embryo, which in turn increase the risk of metabolic disorders such as diabetes, obesity, cardiovascular diseases, Anxiety, Immune dysfunction etc (Lane, 2014; Robertson et.al, 2014). Women with moderate obesity during pregnancy, have an impact on birth weight and risk of metabolic disorders to their grandchildren leaving the risk of their own children (University of Edinburgh, 2013). Genetic factors of parents, available nutritional status, social and cultural environment of pregnant women have an influence on birth weight of their babies (Rachel, 2016).
IMPORTANCE OF YOGIC PRACTICES DURING PREGNANCY

The word Yoga is derived from the Sanskrit root Yuj. The meaning is to bind, join, and attach and yoke, to direct and concentrate one’s attention on, to use and apply. It also means union or communion. It means the disciplining of the mind, intellect, the emotions, the will, which yoga presupposes, it means a poise of the soul which enables one to look at life in all its aspects evenly. (B.K.S. Iyengar)

Yoga is one of the six orthodox systems of Indian philosophy. It was coordinated and systematized by Patanjali in his classical work, the Yoga Sutras, which consists of 195 terse aphorisms in which it is stated that yoga is a state where all activities of the mind are channalized in one direction or the mind is free from distractions. (B.K.S. Iyengar.)

YOGIC CONCEPTS OF HUMAN BODY

The Yoga not only works the physical body by keeping it fit while strengthening and elongating the muscles, it also helps the nervous and circulatory systems by purifying and balancing them. In the past, traditional healers used Yoga postures as a method for healing emotional disorders and illnesses. As a result of regular practice, many benefits will occur. This includes greater endurance, flexibility, deeper breathing, and an overall improvement in mood and emotional well-being. The traditions of Hatha Yoga provide powerful physical results and are intended to serve as a foundation for the mental and spiritual dimensions of Yoga. Hard work can silence the mind, but has no power to alter or transcend emotional and karmic patterns held in the unconscious mind.
The Asanas promotes flexibility of the muscles and strength in the bones and tissues. It also massages the organs, brings balance to different internal and glandular functions, promotes the flow of vital energy, prana (also known as qi in Chinese, or ki in Japanese), and balances the physical and metaphysical parts of the body (koshas). Asanas are techniques that promote awareness, concentration, meditation, and relaxation through the physical body. As the practice becomes more regular, there are significant results. Such results include good mental and physical health through stretching, massage and the stimulation of the energy channels of the internal organs.

YOGIC PRACTICES AND HEALTH

Health is the motto of yoga. Many people still think that yoga is a religion; others believe it to be a kind of magic. In reality yoga is a system of physical, mental and spiritual development. Yoga does not mean just twisting and bending of the body. It is a comprehensive mode of culturing the body. It also secures a powerful tool in manifesting the hidden personality of man. Yoga may be the cheapest and most scientific method of ensuring soundness of the body and mind.

Deviations in the spinal column are found commonly in both young and old. Usually these defects originate as functional and later become structural, because no early treatment was provided.

BENEFITS OF YOGA

The practice of Yoga not only works the physical body by keeping it fit while strengthening and elongating the muscles, it also helps the nervous and circulatory systems by purifying and balancing them. In the past, traditional
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Scientific studies have shown that the practice of Yoga has curative abilities and can prevent disease by promoting energy and health. That is why more and more professionals have started using Yoga techniques in patients with different mental and physical symptoms, such as psycho-somatic stresses and different diseases. Our bodies have a tendency to build up and accumulate poisons like uric acid and calcium crystals, just to mention a few. The accumulation of these poisons manifests in diseases and makes our bodies stiff. A regular Yoga practice can cleanse the tissues through muscle stretching and massaging of the
internal organs. This brings the waste back into circulation so that the lungs, intestines, kidneys, and skin are able to remove toxins in a natural way.

**YOGIC PRACTICES FOR PREGNANT WOMEN**

Yoga seeks to restore the condition of wholeness in which, even if a person should experience a spell of misfortune and illness, he nevertheless feels restored to life and healed.

Although yoga is best used as preventive medicine, some of its practices also have great therapeutic value. The word "therapy" comes from the Greek word therapeuein, meaning to heal, to take care of. Yoga can be understood as a comprehensive approach to healing, for it goes to the root of all disease, which is people’s false relationship to life itself. A person falls ill when his body and mind are out of balance, when the life force falls or circulates freely. Ultimately, there can be no complete healing until we have restored our primal trust in life, which alone removes all those obstructions within us that tend to manifest as ill health.

Practicing yoga during pregnancy is one of the healthiest ways to nurture the pregnant woman and the baby. It helps the pregnant woman to be more patient and gentle with our self and gain confidence. During pregnancy, everyday changes and growth is happen to the pregnant woman.

Pregnancy is something most women anticipate. It brings both fear and joy to the parents, joy for family having a baby and fear of the risk that goes with it. Pregnancy is the period from conception to birth. Some women go into labor before the expected date of giving birth, resulting to premature infants.
The practice of yoga can help to prepare the mind and body for labor and birth as this helps to focus concentrates and keep one healthy. The yoga postures are gentle ways of keeping the body activate and supple and minimize the common pregnancy symptoms like morning sickness and constipation. It can also help in ensuring easier labor and smooth delivery by relieving tension around the cervix and birth canal and by opening the pelvis. The breathing techniques can also become handy during labor. It also helps in restoring body shape, uterus, abdomen, and pelvic floor, and in relieving upper back tension and breast discomfort after childbirth. Special care, however, is needed in choosing the yoga poses that will be practiced. Poses that require laying on the back should be avoided.

For the first trimester, standing yoga poses are advised as this will help strengthen the legs, promote circulation, generate energy, and may reduce leg cramps. It is also advisable to do some stretching such as the hamstrings stretch to avoid sciatica. During the second and third trimester, the time spent for practicing the asanas may be reduced to prevent fatigue and overwork. It is also not advisable to practice from the tenth through the fourteenth week of pregnancy since these are crucial times. Supine poses, backbends, and twisting can be done with modification or if the body is on an incline, the abdomen should not be over stretched. The emphasis of twisting poses should be on the shoulders and the upper back and not on the abdomen. Inversion poses should be avoided though some experienced yoga practitioners usually still feel comfortable doing this until the seventh month.

IMPORTANCE OF YOGA ASANAS
Performing asanas regularly will boost the confidence of the pregnant woman. They make spine strong and flexible, ensure correct posture and establish balance between sympathetic and parasympathetic system.

Regular practice of asanas improves blood circulation, tones up the muscles of spine, abdomen and pelvis which help to support the added weight of uterus.

A woman’s pregnancy, starting from conception, up to delivery can be a stressful period due to various reasons such as physiological, psychological, and emotional conditions, coupled with superstitious beliefs, economic conditions, family traditions etc. All cultures emphasise the fact that the expectant mother’s well-being is an absolutely necessary condition for the well-being of the baby. She needs to be enlightened about her fears, encouraged to adopt the right perspective and emboldened to face pregnancy.

**PHYSIOLOGICAL VARIABLES**

**BODY MASS INDEX DURING PREGNANCY**

Gestational weight gain was associated with increase in abdominal obesity, change in body composition with cardiovascular risk factors. In a prospective study, pregnant women with normal weight gain showed 1 inch excess in waist girth gain compared with non-pregnant women, and overweight black and white women gain 1.5 to 2.5 inches gain in waist girth measurements respectively (Gunderson et al., 2004; Smith et al., 1994).

In a cross-sectional studies, they found that women of childbearing age, having one birth would have drop of 3.5 mg/dl on average plasma high density
lipoprotein level, over a period of 10 years, there will be a drop of 3 to 4 mg/dl drop in good cholesterol in primiparous (Pregnant for first time) compared to nulliparous (Non-pregnant) women (Lewis et al., 1996).

Reason behind the alarming effect of gaining too little weight during pregnancy, is that low birth weight of the baby, delay in breast feeding, delayed milestones, or developmental delay with frequent illness. Gaining too much weight than the recommendation will results increase risk of miscarriage, congenital malformations, hypertension, gestational diabetes, pre-eclampsia, anesthetic complications, vaginal birth after cesarean failure, instrumental delivery, macrosomia and maternal death, obesity during childhood and postnatal weight retention (Catalano, 2006) (NVSSBD, 2015). Data suggests that 375 of normal weight women and 64% of overweight women gain more than the recommended weight gain during pregnancy. Monitoring gestational weight gain has a benefit in wide area of adult, obstetric and neonatal healthcare (IOM, 1990)

**BLOOD PRESSURE DURING PREGNANCY**

The pressure exerted by the blood within the walls of the arteries was known as blood pressure, for normal adult women it should be 120/80 mmhg. During pregnancy it should be 140/85 mmhg. The first number is systolic blood pressure, this is the pressure in the arteries when the heart contracts. The second (bottom) number is diastolic blood pressure, this is the pressure in the arteries, when the heart rests between each heart beat. Normal blood pressure during pregnancy is 140/90 mmhg, if its 140-149/90-99 mmhg considered as mildly high blood pressure, 150-159/100-109 mmhg considered as moderately high blood pressure.
pressure and 160-169/110-119 mmhg would be considered as severely high blood pressure.

Pre-eclampsia is a condition in which, increased in blood pressure above 149/99 mmhg, or above with protein in their urine during pregnancy. Pre-eclampsia would be associated with pregnancy induced hypertension, proteinuria, it may have potential effects on kidneys, liver, brain and blood clotting system (recover itself six weeks after delivery), damage in placenta affects the blood supply, oxygen and other nutrition to the baby.

In case the pregnant women were treated with anti-hypertensive medicine before pregnancy like Angio-tension converting enzyme (ACM) inhibitors, diuretics should consult with their doctors and change the medicine. It may have potential effects on new born babies.

There was a study, hypothesized that, increase in oxidative stress cause potential damage to the endothelial (cellular lining of blood vessels) cells (Saftlas et al., 2004). Yogic practices have been shown to increase the body’s resistance to prevent and reduce the oxidative stress and its negative impact on fetus such as obesity and insulin resistance (Yeo et al., 2001).

Preeclampsia is defined as a toxemia of late pregnancy characterized by hypertension, proteinurea (protein in the urine), and edema (Dorland’s pocket medical dictionary, 2009). It is the leading cause of maternal mortality. 15 to 19% of pregnancy related maternal death is due to preeclampsia (Sorensen et al., 2008). The negative effects of preeclampsia cause constriction of blood vessels in the placenta, which in turn reduces the amount of oxygen and other nutrients that
are transferred to the fetus, results in growth retardation and premature birth (Meher, 2006)

**RESTING PULSE RATE DURING PREGNANCY**

Resting pulse rate vary with every individual women during pregnancy, based on their fitness level before pregnancy, age of the pregnant women etc. Resting pulse rate for adult women is 72-75 beats/ minutes. However during pregnancy, most of the mother’s blood supply will be diverted to uterus, in order to pump enough blood supply to other parts of the body, the heart beats extra, this could be the reason for increase in resting pulse rate up to 80 beats/minutes (ACOG, 1994). During yogic practices it has to be maintained at 140 beats/ minutes. However exertion level can be monitored through, rate of perceived exertion scale to measure the intensity that the pregnant women able to speak in the middle of yogic practices, that could be the possible measure of maintaining the heart rate under control. (Fetal heart rate should be measured separately, an average of 140-150 beats/ minutes (Lisa weber, 2013).

**BIO-CHEMICAL VARIABLES**

**BLOOD GLUCOSE LEVEL DURING PREGNANCY**

The importance of maintaining blood glucose level in normal value is to prevent complications to mother and fetus. Studies suggests that, the weighted average blood glucose levels (+ 1 SD) were 71 + 8 mg/dl fasting, 109 + 13 mg/dl at 1 hour post-prandial and 99 +10 mg/dl at 2 hour post-prandial (care.diabetes journals.org)
Pregnant women with pre-existing diabetes fasting blood glucose level should be 60 – 99 mg/dl, post-prandial after 2 hours should be less than 140 mg/dl and average six month values should be less than or equal to 6.0%. During pregnancy if gestational diabetes has been diagnosed, then fasting blood glucose level should be less than 95 mg/dl and post-prandial blood glucose level should be less than 120 mg/dl.

BLOOD GLUCOSE (FASTING AND POST PRANDIAL)

The American Diabetes Association defines Gestational Diabetes Mellitus (GDM) as “any degree of glucose intolerance with onset during pregnancy” (ADA, 2004). Women who are diagnosed with GDM have a 30 to 84% higher risk for developing GDM in following pregnancies. A study of 23,904 women in the United States reported that more than 70% of women with GDM had body mass index of greater than 25 Kg/M$^2$. Yogic practices has been shown to reduce the risk of GDM, by improving glycemic control and also reduce the risk of developing type 2 diabetes in future (Boinpally et al., 2009).

TRIGLYCERIDES, HDL AND LDL DURING PREGNANCY

Pregnancy would be associated with metabolic changes in mother. These cause drastic changes in maternal physiological, bio-chemical and hematological parameters. These changes were reversible if there are no complications (Cunningham, 2005). Towards third trimester, the glucose utilized by the fetus would increase up to 33mmol/kg/min (Sivan, 1999). This increases the demand of energy in growing fetus, which in turn increases the insulin resistance. In addition, increase in the level of estrogen, progesteron, human placental lactogen(hpl),
human placental growth hormone (hPGH), cortisol, TNF alpha, ILs etc (Ryan, 1988; Wada, 2010; Gonzalez, 2000; Barbour, 2002; Kirwan, 2002) is responsible for insulin resistance, which is associated with development of dyslipidemia in the form of increased level of serum triglycerides, total cholesterol and low density lipoprotein, where as there is a reduction in high density lipoprotein (Kawamoto, 2011; Steinberger, 1995). This transition in lipid profile favors energy sources for growing fetus by sparing glucose and amino acids for the fetus. This helps in building cell membranes, precousor of bile acids and steroid hormones, in addition to this cell proliferation and development of growing body of the fetus.

Even though it has many positive effects on growing fetus, alteration in lipid profiles leads to maternal complications, such as gestational hypertension, gestational diabetes, pre-eclampsia, intrahepatic cholestasis etc. Fetal complications such as, intra-uterine growth retardation, pre-term birth and macrosomia were most common issues (Nascimento, 2016; Jin WY, 2016). These factors in later part of life may develop diabetes mellitus, hypertension, cardiovascular complications, atherosclerosis etc for the mother.

**BLOOD URIC ACID LEVEL DURING PREGNANCY**

Normal level of blood uric acid level is 2.4- 6 mg/dl (NYU Medical center). Increase level of uric acid is associated with gout, is a form of arthritis. Increase in blood uric acid level in turn increases the chance of gestational diabetes and gestational hypertension, leads to pre-eclampsia (i.e) gestational hypertension associated with proteinuria.
Our body metabolizes substances called purines, which can also be present in the body, through the consumption of some form of diet. Break down of purines creates a chemical called uric acid. Human kidneys mostly eliminate all these chemicals through urine output. If the blood uric acid level is above the normal range, which the kidneys cannot excrete through urine, adequately, this leads to increase level of blood uric acid. During first 20 weeks of gestation, if the uric acid level is more than the normal value, it is an indicator that predispose to pre-eclampsia (“Hypertension in pregnancy-Journal”, 2010). Combined effect of gestational diabetes with reduction in insulin level associated with gestational hypertension, pre-eclampsia, proteinuria would increase the blood glucose level in the placental arteries, which supplies the fetus, end up with breathing difficulties after birth, obesity, pre-eclamptic organ damage to fetus if the condition left untreated. Obesity would be the causative factor for all these complications. Reduction in obesity level, with lower body mass index may prevent all these complications. Eating healthy and nutritious food and keeping them active during pregnancy would help to overcome all these issues.

Food rich in purine content are organ meat, liver, kidneys, sweet breads, brains, beef, pork, lamb, beer. Whereas fish, sea food, oat meal, wheat bran, wheat germ contains moderate levels of purine. Green vegetables, tomatoes, fruits, bread, cereals (not whole grain), butter, buttermilk, cheeses, eggs, chocolate, cocoa, coffee, tea, carbonated beverages, peanut butter and nuts contains low level of purines. Low fat, non-fat milk and yogurt contains very low level of purine (webmed, 1995-2015).

PSYCHOLOGICAL VARIABLES
PERCEIVED STRESS LEVEL

Our day to day life causes people to push their mind and body to the extreme limit, often at the expense of physical and mental wellbeing. According to the Mind/Body medical institute at Harvard University, 60 to 90% of all medical office visits in the United States are for stress related disorders. Stress has damaging effects on health and the immune system. Relaxation techniques were helpful tools for coping with stress and promoting long-term health by slowing down the body and calming the mind. These relaxation techniques help to increase body awareness and improve the attention.

When we become stressed, our bodies engage in “fight-or—flight response”. The fight-or-flight responses refer to changes that occur in the body when it prepares to either fight or run. These changes include increased heart rate, blood pressure and respiratory rate, and a 300 to 400% increase in the amount of blood being pumped to the muscles. These changes over a period of time results in increase level of cholesterol, disturbed intestinal activities and depress the immune system. The term, relaxation technique, first coined in the mid 1970s by a Harvard cardiologist named Herbert Benson, refers to changes that occur in the body when it is in a deep state of relaxation. These changes include decreased blood pressure, heart rate, muscle tension and respiratory rate, as well as feelings of being calm and in control.

Research suggests that meditation can help to improve a person’s quality of life and reduce stress hormone levels. Clinical studies also show that relaxation techniques reduce the perception of pain. One clinical study found that among patients undergoing colorectal surgery, those who listened to guided imagery tapes
before, during and after the operation had less pain and needed fewer pain medications than those who did not. Another found that relaxation practices, such as deep breathing, progressive relaxation, and visualization enhanced the immune response among breast cancer patients.

Pregnancy is a sensitive period for a woman’s health, both physical and psychological. Due to the change in physiology of her body and secretion of new hormones can affect the pregnant woman’s mood and emotional status (Ahokas et al, 2005). Last few decades, researchers mostly focused on postnatal depression, than antenatal depression (Giovani et al, 2014). Studies from different countries have estimated the prevalence of antenatal depression to range from 6 to 38%. Pregnant women have all possibilities to suffer from mood disorders compared to non-pregnant women (Dietz et al, 2007). Antenatal depression has often been found to be more frequent than postnatal depression, and twice often (Field, 2011). Many studies shows that the first and last trimester of pregnancy were at highest risk periods for developing mood disorders (Gavin et al, 2005).

Mood disorders throughout pregnancy may lead to complications like pre-eclampsia, spontaneous miscarriage and poor outcomes for the offspring such as intra-uterine growth retardation, placental abnormalities, low birth weight, pre-term birth and frequent admission to the neo-natal intensive care unit (Bonari et al, 2004; Deave et al, 2008; Field et al, 2006; Grote et al, 2010).

It has been proved that the neonates of mother suffered from mood disorders during pregnancy performs poorly on many cluster of the Brazelton Neonatal Behavioral Assessment Scale (NBAS) such as orientation, reflex,
excitability and withdrawal; they were also more aroused and less attentive (Hernandez et al, 2006; Hollins, 2007; Lundy et al, 1999).

The reluctance of pregnant women to take anti-depressant drugs, due to the ill effects of anti-depressants like intrauterine fetal death, physical malformations, growth impairment, behavioral teratogenicity and neonatal toxicity, have lead the clinicians to suggest the patients to approach psychological interventions or alternative forms of treatments such as light therapy, massage therapy or omega-3 fatty acid supplementation (Dennis et al, 2007; Dennis and Allen, 2010).

There is very little evidence to support that alternative therapies were the best choice for antenatal mental illness, rather than drugs. At present there are no recent systematic reports on the newborn focusing on neurodevelopment (Chaudron et al, 2005), rather than poor neonatal adaptation syndrome or similar reaction at births (Grigoriadis et al, 2013).

ANXIETY

Body’s biochemical dysregulation during pregnancy may lead to anxiety, which increases blood pressure and uterine artery resistance, which results in fetal distress, if this issue is not addressed, it may cause maternal and fetal death (Dipietro et al., 2002).

Ravinder Jerath et al, (2015) suggests that understanding the autonomic nervous system and homeostatic changes associated with emotions will be a major challenge for neuroscientists and a fundamental pre-requisite to treat anxiety, stress and emotional disorders. They proposed that these breathing techniques could be used as first-line and supplemental treatment for stress, anxiety,
depression and some emotional disorders rather than targeting neurotransmitters with medication would be a superior method to address these issues.

In the United States, it is estimated that the prevalence of ante-natal depression reaches 10-20% (Fellenzer and Cibula, 2014). Depressive episode during pregnancy is a serious threat to the wellness of pregnant women, indicated an ante-partum depression rate of almost 20%, which is twice as that of 11% after delivery (DeTychey et al, 2005). There are very less number of literatures on prenatal depression, than that of postnatal depression. Pre-natal depression has a negative influence on physical and mental health of both mother and fetus (Glover et al, 1997). Some of the major complications of prenatal depression were associated with lower birth weight of babies associated with elevated resting heart rates, increased risk of developmental delays, pre-term babies, increased physiological reactivity, behavior problems in childhood and adolescence, than that of the children of non-depressed mothers (Bruijin et al, 2009). Prenatal depression will be a strong risk factor for developing post-natal depression. Traditional method of treating prenatal depression with anti-depressants was considered to increase the risk of postpartum hemorrhage and affects the unborn child too (Kieler et al, 2012).

Psychotherapy, complementary and alternative medicines were considered safe and effective, has been used extensively for the treatment option for antenatal depression (Cohen et al, 2006). Indian methods of treating antenatal depression with ethical disciplines, physical postures and spiritual practices in tern contribute to deep relaxation in which the body and mind experience deep sense of calmness (Alwan et al, 2011). They focused on reduction of perceived stress during
pregnancy, enhancement of immune function, improvement in adaptive autonomic response to stress etc. (Muthukrishnan et al, 2016). There was remarkable improvement noticed in gestational age and birth weight of fetus. With improved maternal comfort during delivery, facilitated normal delivery and reduced labor duration with reduction in the requirement of anesthesia (James, 2003). Another meta-analysis focused on exercise for antenatal depression and a significant reduction in depression scores (SMD- 0.46, 95% CI- 0.87 to 0.05. p=0.03, I²=68%) for exercise intervention relative to the comparison group (Daley, 2015).

Integrated yogic programs may be an effective treatment option in alleviating antenatal depression, with the study results shows that the intervention group showed significant improvement in reduction of antenatal depression compared to control group (Satyapriya et al)

OBJECTIVES OF THE STUDY

• The study will help to find out the effect of yogic practices with and without diet modification on selected physiological variables like resting pulse rate, systolic and diastolic blood pressure and Body mass Index among pregnant women.

• The study will help to find out the effect of yogic practices with and without diet modification on selected biochemical variables like blood sugar (fasting and post prandial), Blood lipid profile{Triglycerides, HDL,LDL} and Uric acid among pregnant women.
The study will help to find out the effect of yogic practices with and without diet modification on selected psychological variables like stress and Anxiety among pregnant women.

REASON FOR SELECTION OF TOPIC AND VARIABLES

To prevent complications during pregnancy, we need to focus on nutritional status and physical activity, which is beneficial for pregnant mother and growing fetus (WHO, Maternal mortality 2016). The health status of women during pregnancy is directly proportional to the health of Newborn babies. Having healthy food during pregnancy and regular exercise for an hour a day for five to six days a week would help to reduce the risk and complications during pregnancy, which in turn improve the success rate of healthy babies. Many women die during pregnancy or following childbirth due to various reasons, most important among them were severe bleeding, infections, high blood pressure, anemia etc. which can be addressed earlier and treated with careful monitoring if known before. Interventions should be found on directing the parent's health in advance, during pre-conception assisting them to lead a healthy life will not only improve their lifestyle, but also the health of their children (University of Southampton, 2016). Hence the aim of the present study was to investigate the effects of yogic practices with and without diet modification on selected physiological, bio-chemical and psychological variables among pregnant women.

STATEMENT OF THE PROBLEM
The purpose of the present study was to investigate the effects of yogic practices with and without diet modification on selected physiological, bio-chemical and psychological variables among pregnant women.

HYPOTHESIS

The following were hypothesized for this study:

1. It was hypothesized that there would be significant difference on selected physiological, bio-chemical and psychological variables due to yogic practices with diet modification group among pregnant women than the control group.

2. It was hypothesized that there would be significant difference on selected physiological, bio-chemical and psychological variables due to yogic practices without diet modification group among pregnant women than the control group.

3. It was hypothesized that there would be significant difference on selected physiological, bio-chemical and psychological variables due to yogic practices with diet modification group among pregnant women than yogic practices without diet modification group.

SIGNIFICANCE OF THE STUDY

This study is significant in the following ways:

1. The findings of this study would create interest among future researchers to make further studies on this area.
2. This study would bring out the importance of yogic practices among pregnant women.

3. This study would bring out the importance of diet modification outcome among pregnant women.

4. This study would give adequate knowledge about the influence of yogic practices and diet modification among pregnant women.

5. This study would describe the changes in physiological, bio-chemical and psychological variables due to yogic practices and diet modification among pregnant women.

6. The findings of the study would be helpful for the further research studies, also helpful for the pregnant women.

**DELIMITATIONS**

1. The study was delimited to Chennai city, Public Health Centres only.

2. The study was delimited to 60 pregnant women randomly selected from different maternity centres only.

3. This research confined among women in the age group of 21 to 28 years only.

4. The study was delimited to five days a week (Monday to Friday), between 6.30 am to 8 am only.

5. The study was delimited to independent variables such as yogic practices and modified diet pertaining to pregnancy only.

6. The study was delimited to dependent variables such as physiological variables namely body mass index, blood pressure (systolic & diastolic), resting pulse rate, bio-chemical variables namely blood sugar level (fasting
& post-prandial), triglycerides, high density lipoprotein, low density lipoprotein and blood uric acid level, psychological variables namely perceived stress and anxiety only.

LIMITATIONS

1. Factors like personal habits, life style, daily routine and climatic condition that may have influence on variables will be recognized as a limitation.

2. The heredity contributes to both physical and mental efficiency will not be controlled.

3. The previous experience of the subjects will not be considered in this study.

4. Sociological aspect of their day to day life, interaction with their environment will not be considered.

5. General activity, motivation of the subjects and factors that affects metabolic function is beyond the control of the researcher.

6. Though the subjects will be motivated verbally, no attempt will be made to differentiate the motivation level during the period of testing.

7. Stress factors related to family, environment and work place might be influencing the study can be considered as limitation.

MEANING AND DEFINITION OF TERMS

YOGIC PRACTICES
The term “yoga” comes from a Sanskrit word meaning “union”. Yogic practices were a combination of physical postures to strengthen the muscles, meditation to relieve stress, and breathing techniques to improve the heart and lung function (Caldwell, 2005).

The term yoga comes from a Sanskrit word which means yoke or union. Yoga is a method of joining the individual self with the divine, Universal spirit, or cosmic consciousness (SwamisathyanandaSaraswathi).

**DIET**

In nutrition, diet is the combination of food consumed by a person. The word diet indicates the use of specific intake of nutrition for health reasons. Complete nutrition includes ingestion and absorption of vitamins, minerals, and food energy in the form of carbohydrates, proteins and fats. In order to have a better quality of life and to achieve health and longevity, clean dietary habits should be followed (askoxford.com).

**BODY MASS INDEX**

The body mass index (BMI) is a measure of someone's weight in relation to their height. The BMI is equal to a person's weight divided by their height. It is calculated as:

\[ \text{BMI} = \frac{\text{Weight in kilograms}}{\text{Height in meters}^2} \] (NHLBI, 1998).

**BLOOD PRESSURE**
Pressure that is exerted by the blood upon the walls of the blood vessels and especially arteries and that varies with the muscular efficiency of the heart, the blood volume and viscosity, the age and health of the individual, and the state of the vascular wall (Merriamwebster, 1854)

SYSTOLIC BLOOD PRESSURE

The blood pressure when the heart is contracting. It is specifically the maximum arterial pressure during contraction of the left ventricle of the heart (medicinenet.com).

DIASTOLIC BLOOD PRESSURE

The lowest arterial blood pressure of a cardiac cycle occurring during diastole of the heart called also diastolic pressure (medicinenet.com).

RESTING PULSE RATE

Resting heart rate (RHR) is the number of times the heart beats per minute while at complete rest. It is an indicator of physical fitness the resting heart rate decrease when the heart becomes stronger with aerobic exercise training. A healthy resting heart rate for adults is 60 to 80 bpm (www.verywell.com, 2017).

BLOOD GLUCOSE

Blood sugar, or blood glucose, is sugar that the bloodstream carries to all the cells in the body to supply energy. Blood sugar or blood glucose measurements represent the amount of sugar being transported in the blood during one instant (Christian Nordqvist, 2017).
FASTING BLOOD GLUCOSE

A test to determine how much glucose (sugar) is in a blood sample after an overnight fast. The fasting blood glucose test is commonly used to detect diabetes mellitus. A blood sample is taken in a lab, physician's office, or hospital. The test is done in the morning, before the person has eaten. The normal range for blood glucose is 70 to 100 mg/dl. Levels between 100 and 126 mg/dl are referred to as impaired fasting glucose or pre-diabetes. Diabetes is typically diagnosed when fasting blood glucose levels are 126 mg/dl or higher (medicinenet.com).

POSTPRANDIAL BLOOD GLUCOSE LEVEL

A 2-hour postprandial blood glucose test measures blood glucose exactly 2 hours after eating a meal, timed from the start of the meal. By this point blood sugar has usually gone back down in healthy people, but it may still be elevated in people with diabetes. Thus, it serves as a test of whether a person may have diabetes, or of whether a person who has diabetes is successfully controlling their blood sugar (www.webmd.com).

LIPID PROFILE

Lipid profile: A pattern of lipids in the blood. A lipid profile usually includes the levels of total cholesterol, high-density lipoprotein (HDL) cholesterol,
triglycerides, and the calculated low-density lipoprotein (LDL) "cholesterol (medicinenet.com).

HIGH DENSITY LYPOPROTEIN

A lipoprotein of blood plasma that is composed of a high proportion of protein with little triglyceride and cholesterol and that is correlated with reduced risk of atherosclerosis called also good cholesterol (Merriamwebster, 1954).

LOW DENSITY LYPOPROTEIN

A complex of lipids and proteins that transport cholesterol in the blood, which is in high concentration, and is associated with increased risk of atherosclerosis and coronary heart disease (dictionary.com, 2017)

TRIGLYCERIDES

Triglycerides: The major form of fat stored by the body. A triglyceride consists of three molecules of fatty acid combined with a molecule of the alcohol glycerol. Triglycerides serve as the backbone of many types of lipids (fats). Triglycerides come from the food we eat as well as from being produced by the body. Markedly high triglyceride levels (greater than 500mg/dl) can cause inflammation of the pancreas (pancreatitis). Therefore, these high levels should be treated aggressively with low fat diets and medications, if needed (medicinenet.com).
Fatty compounds synthesized from carbohydrates during the process of digestion and stored in the body’s adipose tissues. High levels of triglycerides in the blood are associated with insulin resistance (Collins Dictionary of Medicine, 2004, 2005).

BLOOD URIC ACID LEVEL

Uric acid: A breakdown product of purines that are part of many foods (medicinenet.com). During early pregnancy serum uric acid levels fall, often to 3 mg/dl or below, related to the uricosuric effects from estrogen and from the increase in renal blood flow. Uric acid levels then increase during the third trimester, reaching levels of 4–5 mg/dl by term (Kang et al., 2004).

STRESS

Stress is defined as “a state of psychological and physiological imbalance resulting from the disparity between situational demand and the individual's ability and motivation to meet those needs.” “The rate of all wear and tear caused by life.” (Hans Selye, 2011)

ANXIETY

Anxiety is an emotion characterized by feelings of tension, worried thoughts and physical changes like increased blood pressure. People with anxiety disorders usually have recurring intrusive thoughts or concerns. They may avoid certain situations out of worry (www.apa.com).
Pregnancy anxiety is a particular emotional state tied to pregnancy-specific concerns, such as worries about the health of the baby and childbirth. A growing body of research demonstrates that pregnancy anxiety is an important risk factor for preterm birth and other adverse birth and child development outcomes (Chrisdunkelschetter, 2014).

CHAPTER I

INTRODUCTION

Pregnancy is one of the most critical and unique period in a women’s life cycle. Due to higher nutritional requirement this group is considered too vulnerable and critical in life span (Mamta Singh et al 2009).

Pregnancy occurs as a result of the female gamete or oocyte merging with the male gamete, spermatozoon, in a process referred to, in medical science, as "fertilization," or more commonly known as "conception." After the point of "fertilization," it is referred to as an egg. The fusion of male and female gametes usually occurs through the act of sexual intercourse, resulting in spontaneous pregnancy. However, the advents of artificial insemination and in vitro fertilisation have also made achieving pregnancy possible in cases where sexual intercourse does not result in fertilization.

Most pregnant women experience a number of symptoms, such as missed menstrual period, nausea and vomiting, excessive tiredness and fatigue, craving for certain foods not normally considered a favorite, and frequent urination particularly during the night, which can signify pregnancy.
There are few complaints that may occur during pregnancy. Back pain, constipation, oedema (swelling), regurgitation, heartburn, and nausea are other common complaints that may be caused by Gastroesophageal Reflux Disease (GERD); haemorrhoids, constipation, pelvic girdle pain, frequent urination, and varicose veins are other complaints experienced by some women.

Child birth is surely the greatest act performed by women. It can be a great emotional experience. The physical and psychological aspects cannot be separated. For most women, labour is a time of apprehension, of fear and agony. But, with proper antenatal preparation the majority of women can have a labour that is easy and painless or almost painless and some can actually enjoy the labour and experience a sense of fulfilment.

Pregnancy is not a disease. It is an ideal environment to give new life to the baby. At the time of pregnancy, the mother should be more positive and relaxed. Cognitive behaviour therapy helps to organize the thoughts in the positive way. In addition, yoga therapy helps to relax the mind, as well as strengthen the body.

Yoga always emphasizes on precepts like, accept life as it is, put in the best efforts wherever it is possible and then let the positive spirits overtake from the mind and it is the mind which makes or breaks a situation. The essence of harmoniously handling a glorious pregnancy lies in the ability to gain complete control over the mind, and then the body follows willingly. During the last few decades, research in yoga has proved beyond doubts that yoga helps to prevent and cure many chronic ailments. Yogic practices integrate the body, mind and spirit. They bring harmony and develop a restful and positive attitude towards life. A comprehensive programme of yogic practices designed for pregnant women will
help them to have correct posture, flexibility of spine, improve their breathing capacity and to manage stress. It helps to build immunity, inner strength, improve control over body and emotions. In short it is the best preventive and curative therapy for many ailments that can occur during pregnancy. It will also ensure the baby's healthy growth.

1. PREGNANT WOMEN

1.1. CONCEPT AND DURATION

The duration of pregnancy is from the date of conception till the day of delivery. It is typically 38 weeks after conception. Though pregnancy begins at conception, it is more convenient to date from the first day of a woman's last menstrual period. Starting from one of these dates, the expected date of delivery can be calculated. 38 weeks is 9 months and 6 days, which forms the basis of Naegle's rule for estimating date of delivery. More accurate and sophisticated algorithms take into account other variables, such as whether this is the first or subsequent child (i.e., pregnant woman is a primiparous or a multiparous, respectively), ethnicity, parental age, length of menstrual cycle, and menstrual regularity.

Pregnancy is considered "at term" when gestation attains 37 complete weeks but is less than 42 weeks (between 259 and 294 days since LMP). Events before completion of 37 weeks (259 days) are considered pre-term; from week 42 (294 days) events are considered post-term. When a pregnancy exceeds 42 weeks (294 days), the risk of complications for the woman and the fetus increases
significantly. As such, obstetricians usually prefer to induce labour, in an uncomplicated pregnancy, at some stage between 41 and 42 weeks.

Recent medical literature prefers the terminology pre-term and post-term to premature and postmature. Pre-term and post-term are unambiguous, whereas premature and postmature have historical meaning and relate more to the infant's size and state of development rather than to the stage of pregnancy.

Accurate dating of pregnancy facilitates calculating the results of various pre-natal tests (for example, the triple test). An obstetrician may decide to induce labour if a fetus is perceived to be overdue. Furthermore, if LMP and ultrasound dating predict different respective due dates, with the latter being later, this might signify slowed fetal growth and therefore require closer review. Pregnancy ends in childbirth.

Childbirth is the process whereby an infant is born. It is considered by many to be the beginning of the infant's life, and age is defined relative to this event in most cultures.

A woman is considered to be in labour when she begins experiencing regular uterine contractions, accompanied by changes of her cervix — primarily effacement and dilation. While childbirth is widely experienced as painful, some women do report painless labours, while others find that concentrating on the birth helps to quicken labour and lessen the sensations. Most births are successful vaginal births, but sometimes complications arise and a woman may undergo a cesarean section.
During the time immediately after birth, both the mother and the baby are hormonally cued to bond, the mother through the release of oxytocin, a hormone also released during breastfeeding.

1.2. DIAGNOSIS

The beginning of pregnancy may be detected in a number of different ways, either by a pregnant woman without medical testing, or by using medical tests with or without the assistance of a medical professional.

A number of early medical signs are associated with pregnancy. These signs typically appear, if at all, within the first few weeks after conception. Although not all of these signs are universally present, nor are all of them diagnostic by themselves, taken together they make a presumptive diagnosis of pregnancy. These signs include the presence of human chorionic gonadotropin (hCG) in the blood and urine, missed menstrual period, implantation bleeding that occurs at implantation of the embryo in the uterus during the third or fourth week after last menstrual period, increased basal body temperature sustained for over 2 weeks after ovulation, Chadwick's sign (darkening of the cervix, vagina, and vulva), Goodell's sign (softening of the vaginal portion of the cervix), Hegar's sign (softening of the uterus isthmus), and pigmentation of linea alba - Linea nigra, (darkening of the skin in a midline of the abdomen, caused by hyperpigmentation resulting from hormonal changes, usually appearing around the middle of pregnancy).

Pregnancy detection can be accomplished using one or more of various pregnancy tests, which detect hormones generated by the newly formed placenta.
Clinical blood and urine tests can detect pregnancy 12 days after implantation, which is as early as 6 to 8 days after fertilization. Blood pregnancy tests are more accurate than urine tests. Home pregnancy tests are personal urine tests, which normally cannot detect a pregnancy until at least 12 to 15 days after fertilization. Both clinical and home tests can only detect the state of pregnancy, and cannot detect the age of the embryo.

Despite all the signs, some women may not realize they are pregnant until they are quite far along in their pregnancy, in some cases, not even until they begin labour. This can be caused by many factors, including, irregular periods (quite common in teenagers), certain medications (not related to conceiving children), and obese women who disregard their weight gain. Others may be in denial of their situation.

1.3. PHYSIOLOGY

Pregnancy is typically broken into three periods, or trimesters, each of about three months. These distinctions are useful in describing the changes that take place over time.

1.3.1. FIRST TRIMESTER

Traditionally, doctors have measured pregnancy from a number of convenient points, including the day of last menstruation, ovulation, fertilization, implantation and chemical detection. In medicine, pregnancy is often defined as beginning, when the developing embryo becomes implanted into the endometrial lining of a woman's uterus. In some cases, where complications arise, the fertilized
egg might implant itself in the fallopian tubes or the cervix, causing an ectopic pregnancy. Most pregnant women are not aware of implantation, although it is not uncommon to experience minimal bleeding at implantation. Some women also experience cramping during their first trimester. This is usually of no concern unless there is spotting or bleeding as well. After implantation, the uterine endometrium is called the decidua. The placenta, which is formed partly from the decidua and partly from outer layers of the embryo, is responsible for transport of nutrients and oxygen to, and removal of waste products from the fetus. The umbilical cord is the connecting cord from the embryo or fetus to the placenta. The developing embryo undergoes tremendous growth and changes during the process of fetal development.

Morning sickness occurs in about seventy percent of all pregnant women and typically improves after the first trimester. In the first 12 weeks of pregnancy the nipples and areolas darken due to a temporary increase in hormones. Most miscarriages occur during this period.

1.3.2. SECOND TRIMESTER

Months 4 through 6 of the pregnancy are called the second trimester. Most women feel more energized in this period, and begin to put on weight as the symptoms of morning sickness subside and eventually fade away.

In the 20th week, the uterus, the muscular organ that holds the developing fetus, can expand up to 20 times its normal size during pregnancy. Although the fetus begins moving and takes a recognizable human shape during the first trimester, it is not until the second trimester that movement of the fetus, often
referred to as "quickening", can be felt. This typically happens in the fourth month, more specifically in the 20th to 21st week, or by the 19th week if the woman had been pregnant before. However, it is not uncommon for some women not to feel the fetus move until much later. The placenta fully functions at this time and the fetus makes insulin and urinates. The reproductive organs distinguish the fetus as male or female.

1.3.4. THIRD TRIMESTER

During the period final weight gain takes place, which is the most weight gain throughout pregnancy. The fetus grows the most rapidly during this stage, gaining up to 28g per day. The woman's belly transforms in shape as the belly drops due to the fetus turning in a downward position ready for birth. During the second trimester, the woman's belly would have been very upright, whereas in the third trimester it drops down quite low, and the woman can be able to lift her belly up and down. The fetus begins to move regularly, and is felt by the woman. Fetal movement can become quite strong and be disruptive to the woman. The woman's will sometimes becomes convex, "popping" out, due to her expanding abdomen. This period of her pregnancy can be uncomfortable, causing symptoms like weak bladder control and back-ache. Movement of the fetus becomes stronger and more frequent. The woman can feel the fetus "rolling" and it may cause pain or discomfort when it is near the woman's ribs and spine.

It is during this time that a baby born prematurely may survive. The use of modern medical intensive care technology has greatly increased the probability of premature babies surviving, and has pushed back the boundary of viability to much earlier dates than would be possible without assistance. In spite of these
developments, premature birth remains a major threat to the fetus, and may result in ill-health in later life, even if the baby survives.

1.4. PHYSICAL CHANGES IN PREGNANCY

Recent studies found that 32% of pregnant women alone gain recommended amount of weight, 21% have gained too little and 48% have gained too much of weight during pregnancy (NVSSBD, 2015) (National Vital Statistics System birth data). Gestational weight gain may influence the prevalence and severity of obesity in future generations. Pregnancy is the crucial period to make interventions and address these issues by monitoring the dietary intake and physical activities (IOM, 1990).

High Body mass index before pregnancy is associated with greater gestational weight gain (Mckeown and Record, 1957). The combination of gestational weight gain with post-partum weight retention would have long term health issues for woman. Mostly it is associated with weight gain during first pregnancies, than the subsequent pregnancies (Billewicz, 1970).

High proportion of women reported that they were either not given advice on how much weight to gain during pregnancy or were advised to gain outside of the guidelines for their prepregnancy Body mass index category (Cogswell et al, 1999; Stotland et al, 2005). The data from 2002-2003 pregnancy risk assessment monitoring system show that 50-73% of women gain either below or above the guidelines for their pre-pregnancy Body mass index category (Rasmussen et al, 2009). Institute of Medicine, 1990 guidelines suggests the weight gain (15 lbs) for obese women, but no upper range. What time we measure or diagnose the
gestational diabetes mellitus is important, because treatment with diet, insulin and increased physical activity may affect the subsequent weight gain during pregnancy. Higher Gestational Weight Gain (GWG) may lead to excessive postnatal weight retention, which in turn increase the risk of fetus in the subsequent pregnancy and women’s own long-term health. The Institute of Medicine was concerned about the potential low or no gain during pregnancy, mainly focused on women with glucose intolerance, to be harmful if it was associated with fetal growth restriction or ketonemia (Rasmussen et al, 2009).

They have recommended that any weight loss issues should be attempted only during preconception or between pregnancies, not during pregnancy, in order to maintain the safety of the fetus. The IOM recommendation for weight gain is 6.8-11.3 Kg (15-25 lb) for overweight women (BMI of 25-29.9) and 5-9.1 Kg (11 to 20 lb) for all obese women. Gestational weight gain below this recommendation does not affect the fetal growth or neonatal outcomes. In several studies weight gain of 2.7-6.4 Kg (6-14 lb) of overweight women had similar fetal growth, pernatal and neonatal outcomes, and less postpartum weight retention than those who gained recommended weight during pregnancy (Langford, 2011).

Pregnant women should practice moderate-intensity physical activity, for 30 minutes a day in order to prevent excess weight gain during pregnancy. Regularly checking their weight gain from the beginning of pregnancy and also during antenatal care visits, hence any sign of inadequate or excess gestational weight gain can be identified at the early stage and appropriate steps can be taken to prevent it (Cynthia, 2014).

1.5. PHYSIOLOGICAL CHANGES IN PREGNANCY
The body must change its physiological and homeostatic mechanisms in pregnancy to ensure, increases in blood sugar, breathing and cardiac output are all required to meet the need of the fetal growth.

1.6. HORMONAL CHANGES

Levels of progesterone and estrogens rise continually throughout pregnancy, suppressing the hypothalamic axis and subsequently the menstrual cycle. The woman and the placenta also produce many hormones.

Prolactin levels increase due to maternal Pituitary gland enlargement by 50%. This mediates a change in the structure of the Mammary gland from ductal to lobular-alveolar. Parathyroid hormone is increased due to increase in calcium uptake in the gut and reabsorption by the kidney. Adrenal hormones such as cortisol and aldosterone also increase.

Placental lactogen is produced by the placenta and stimulates lipolysis and fatty acid metabolism by the woman, conserving blood glucose for use by the fetus. It can also decrease maternal tissue sensitivity to insulin, resulting in gestational diabetes.

1.7. MUSCULOSKELETAL CHANGES

The body's posture changes as the pregnancy progresses. The pelvis tilts and the back arches to help keep balance. Poor posture occurs naturally from the stretching of the woman's abdominal muscles as the fetus grows. These muscles are less able to contract and keep the lower back in proper alignment. The pregnant woman has a different pattern of gait. The step lengthens as the pregnancy progresses, due to weight gain and changes in posture. On an average, a woman's
foot can grow by a half size or more during pregnancy. In addition, the increased body weight of pregnancy, fluid retention, and weight gain lowers the arches of the foot, further adding to the foot's length and width. The influences of increased hormones such as oestrogen and relaxin initiate the remodelling of soft tissues, cartilage and ligaments. Certain skeletal joints such as the symphysis pubis and sacroiliac widen or have increased laxity.

One of the most noticeable alterations in pregnancy is the gain in weight. The enlarging uterus, the growing fetus, the placenta and liquor amnii, the acquisition of fat and water retention, all contribute to this increase in weight. The weight gain varies from person to person and can be anywhere from 5 pounds (2.3 kg) to over 100 pounds (45 kg). Other physical changes during pregnancy include breasts increasing two cup sizes. Also, areas of the body such as the forehead and cheeks (known as the 'mask of pregnancy') become darker due to the increase of melanin being produced.

1.8. CARDIOVASCULAR CHANGES

Blood volume increases by 40% in the first two trimesters. This is due to an increase in plasma volume through increased aldosterone. Progesterone may also interact with the aldosterone receptor, thus leading to increased levels. Red blood cell numbers increase due to increased erythropoietin levels.

Cardiac function is also modified, with increased heart rate and increased stroke volume. A decrease in vagal tone and increase in sympathetic tone is the cause. Blood volume increases act to increase stroke volume of the heart via
Starling's law. After pregnancy the change in stroke volume is not reversed. Cardiac output rises from 4 to 7 litres in the 2nd trimester.

Blood pressure also fluctuates. In the first trimester it falls. Initially this is due to decreased sensitivity to angiotension and vasodilatation provoked by increased blood volume. Later, however, it is caused by decreased resistance to the growing uteroplacental bed.

1.9. RESPIRATORY CHANGES

Decreased functional residual capacity is seen, typically falling from 1.7 to 1.35 litres, due to the compression of the diaphragm by the uterus. Tidal volume increases, from 0.45 to 0.65 litres, giving an increase in pulmonary ventilation. This is necessary to meet the increased oxygen requirement of the body, which reaches 50ml/min, 20ml of which goes to reproductive tissues.

Progesterone may act centrally on chemoreceptors to reset the set point to a lower partial pressure of carbon dioxide. This maintains an increased respiration rate even at a decreased level of carbon dioxide.

1.10. METABOLIC CHANGES

As there is increased requirement for nutrients, it is given by fetal growth and fat deposition. Changes are caused by steroid hormones, lactogen, and cortisol.

Maternal insulin resistance can lead to gestational diabetes. Increased liver metabolism is also seen, with increased gluconeogenesis to increase maternal glucose levels.

1.11. RENAL CHANGES
Renal plasma flow increases, as does aldosterone and erythropoietin production as discussed. The tubular maximum for glucose is reduced, which may precipitate gestational diabetes.

1.12. NUTRITION

In order to cope up with all these changes, a balanced, nutritious diet is an important aspect of a healthy pregnancy. Eating a healthy diet, balancing carbohydrates, fat, and proteins, and eating a variety of fruits and vegetables, usually ensures good nutrition. Those whose diets are affected by health issues, religious requirements, or ethical beliefs may consult a health professional for specific advice.

Adequate periconceptional folic acid (also called folate or Vitamin B9) intake has been proven to limit fetal neural tube defects, preventing spina bifida, a very serious birth defect. The neural tube develops during the first 28 days of pregnancy, explaining the necessity to guarantee adequate periconceptional folate intake. Folates (from folia, leaf) are abundant in spinach (fresh, frozen, or canned), and are also found in green vegetables, salads, citrus fruit and melon, chickpeas (i.e. in the form of hummus or falafel), and eggs.

DHA omega-3 is a major structural fatty acid in the brain and retina, and is naturally found in breast milk. It is important for a mother to consume adequate amounts of DHA during pregnancy and while nursing to support her well-being and the health of her infant. Developing infants cannot produce DHA efficiently, and must receive this vital nutrient from the mother through the placenta during pregnancy and in breast milk after birth. Several micronutrients are important for
the health of the developing fetus, especially in areas of the world where insufficient nutrition is prevalent.

1.13. IMMUNE TOLERANCE

The fetus inside a mother may be viewed as an unusually successful allograft, since it genetically differs from the mother. In the same way, many cases of spontaneous abortion may be described in the same way as maternal transplant rejection.

1.13.1. DRUGS IN PREGNANCY

Drugs used during pregnancy can have temporary or permanent effects on the fetus. Therefore many physicians would prefer not to prescribe for pregnant women, the major concern being over teratogenicity of the drugs. This results in inappropriate treatment of pregnant women. Use of drugs in pregnancy is not always wrong. For example, high fever is harmful for the fetus in the early months. Use of paracetamol is better than no treatment at all. Also, diabetes mellitus during pregnancy may need intensive therapy with insulin. Hence, a cautious prescription of drugs during pregnancy is recommended.

1.13.2. EXPOSURE TO TOXINS

Various toxins pose a significant hazard to fetus during development:

Alcohol ingestion during pregnancy may cause fetal alcohol syndrome, a permanent and often devastating birth-defect syndrome. Women who have suffered mercury poisoning in pregnancy have sometimes given birth to children with serious birth defects, termed Minamata disease.
1.14. NUTRITIONAL REQUIREMENTS DURING PREGNANCY

1.14.1. ENERGY

The maternal diet during pregnancy must provide sufficient energy to ensure the delivery of a full-term, healthy infant of adequate size and appropriate body composition. The total energy cost of pregnancy has now been estimated at around 321 MJ (77 000 kcal). This is based on data from longitudinal studies and factorial calculations of the extra energy required during this period (FAO/WHO/UNU 2004).

1.14.2. PROTEIN

The total protein requirement during pregnancy has been estimated to be approximately 925 g for a woman gaining 12.5 kg and delivering an infant of 3.3 kg (Hytten1980). Protein is not gained at a constant rate, the rate at which protein is deposited increases as pregnancy progresses. Estimates for the first, second, third and fourth quarters are 0.64, 1.84, 4.76 and 6.10 g of protein per day, respectively (FAO/WHO/UNU 1985).

However, more recent estimates from longitudinal studies of women in developed countries (e.g. UK, USA) suggest protein gains in pregnancy may be lower, in the range of 497 to 696 g for an average weight gain of 12 kg (FAO/WHO/UNU 2004).

1.14.3. LIPIDS
No dietary reference intakes (DRIs) for total lipids during pregnancy have been established. The amount of fat in the diet should depend on energy requirements for proper weight gain (IOM 2002).

However, pregnant women and those planning a pregnancy need an adequate dietary intake of essential fatty acids and their longer-chain derivatives, DHA and AA, which are necessary for the development of the brain and nervous system of the fetus, particularly in late pregnancy (BNF 1999). The best dietary source of long chain n-3 fatty acids (EPA and DHA) is oil-rich fish (C.S. Williamson 2006).

The Institute of medicine has established DRIs for carbohydrate intake during pregnancy. The estimated average requirement (EAR) is 135g / day, and the adequate intake (AI) is 175 g / day (IOM, 2002). The recommended amount of 135 to 175 g/d is the quantity needed to provide enough calories in the diet, to prevent ketosis, and maintain appropriate blood glucose levels during pregnancy (L. Kathleen Mahan 2004).

1.14.4. FETAL NUTRITION AND GROWTH

Fetal nutrition is the main regulator of fetal growth in late gestation. However the influence of maternal nutrition on fetal growth is also dependent on the relative efficiency of the fetal supply line, the timing and balance of changes in maternal nutrition, and the indirect effects of altered maternal nutrition on fetal endocrine status and substrate balance (Jane E. Harding 2001).

Cross breeding and embryo transplant experiments in a variety of animal species have clearly demonstrated that size at birth is largely determined by the
maternal uterine environment, with the parental genotype having a relatively small influence (Snow MHL 1989).

Fetal growth in late gestation is normally limited by maternal size and her capacity to supply nutrients to her fetus; a phenomenon known as maternal constraint. Thus fetal growth in late gestation is normally regulated by fetal nutrient supply (Gluckman P 1992). This principle of the nutritional regulation of fetal growth is relatively easily demonstrated in animal species. In pregnant sheep, maternal under-nutrition in late gestation results in prompt slowing of fetal growth, and fetal growth resumes with maternal re-feeding [a) Harding JE 1997, b) Harding JE 1997]. However such a relationship is more difficult to demonstrate in human pregnancy. There are case reports of women with severe under-nutrition for medical reasons resulting in impaired fetal growth which is at least partially reversed by improving maternal nutrition status (Rivera-Alsina ME 1984), (Adami GF 1992). Nevertheless, in general the relationship between maternal nutrition and fetal growth is difficult to demonstrate in human pregnancy. This difficulty in demonstrating a direct relationship between maternal nutrition and fetal growth relates largely to the very indirect relationship between maternal nutrition and fetal nutrition. The mammalian fetus grows at the end of a long and sometimes precarious “supply line”, linking maternal diet at one end with fetal tissue nutrient uptake at the other (Bloomfield FH 1998). The supply line includes maternal diet, maternal metabolism and endocrine status, uterine and umbilical blood flows and placental transfer capacity and metabolism. Relatively large changes in maternal nutrition may have little impact on fetal nutrition if the capacity of the fetal supply line allows a large margin of safety for fetal growth. Conversely, common clinical causes of impaired fetal growth in well nourished
populations such as maternal hypertension associated with reduced uterine blood flow, or placental infarcts resulting in reduced placental transfer capacity, may severely limit fetal nutrient supply without a corresponding change in maternal nutrition.

The indirect relationship between maternal nutrition and fetal growth is further confused by the influence of the timing and balance of maternal nutrient intake on fetal growth. Much of the work on nutrient balance has come from human studies. Although randomized controlled trials of maternal dietary supplements have shown relatively little effect on birth weight, supplements with a relatively high proportion of calories provided as protein actually result in reduced mean birth weight (Kramer M.S 1999). Similarly, in a relatively well nourished population, the combination of high carbohydrate intake in early pregnancy and low protein intake in late pregnancy was shown to be associated with reduced birth-weight, low ponderal index and reduced placental weight (Godfrey K 1996), (Godfrey KM 1997). The proportions of protein and carbohydrate in a woman’s diet in pregnancy have also been shown to influence both the placental size and the blood pressure of the adult offspring (Campbell DM 1996).

There is also increasing evidence that maternal nutrition around the time of conception is particularly critical in the regulation of fetal growth.

Maternal weight before pregnancy is an important influence on birth size in women, but it is not yet clear to what extent improved maternal nutrition in early pregnancy may influence birth size independent of nutritional status at pregnancy onset.
Although it is clear from experimental data that nutrition influences fetal growth in late gestation, the mechanisms by which this occurs are far from clear. It appears superficially logical to assume that nutrient limitation to the fetus at a given stage of development is likely to inhibit growth of organs that are growing rapidly at that time. However simple limitation of substrates to growing organs leading to reduction in size of those organs is an inadequate explanation. For example, maternal protein restriction in pigs results in reduced fetal weight and length at mid-gestation at a time when the fetus is extremely small and fetal protein requirements for growth are unlikely to have been limiting (Pond WG 1991). Similarly, maternal under-nutrition in either early or late gestation in sheep, leading to fetal under nutrition and limited nutrient supply to growing organs (Oliver MH 2000), (Harding JE 2001).

1.15. DIATARY MODIFICATION DURING PREGNANCY

All the interventions published since 2000 have concentrated on reducing or maintaining gestational weight gain through various approaches. Some of those were counseling on diet or exercise or the combination of both, regular checking of weight gain, providing unique physical activity classes, dietary prescription by the Nutritionist and daily recording of dietary intake.

Taking balanced diet like whole grains, vegetables, fruits, low fat dairy and lean protein and avoiding food contains sugar and solid fats like soft drinks, desserts, fried foods, whole milk and fatty meats will maintain the healthy weight gain during pregnancy (IOM, 1990).
Dietary goals might be helpful to meet the additional nutritional requirement during pregnancy. Physical activity, when combined with dietary goals would be an effective strategy to prevent excessive gestational weight gain (Phelen et al., 2011).

1.16. ESSENTIALS OF PHYSICAL ACTIVITY DURING PREGNANCY

Women with a normal body mass index before pregnancy, who gain excessive weight or very little weight than the recommended weight during pregnancy, have an high level of impact on the metabolic rate of their offsprings which in turn affects the appetite control and energy expenditure of the fetus, in later stages of life, leads to childhood obesity and other complications (Sneha et al., 2014). Women with excessive weight gain during pregnancy have 80 percent chance to have an obese child; women with very little weight gain have 63 percent chance to have an obese child (Sneha et al., 2014). Greater episodes of congenital abnormalities, pre-term babies, pre-eclampsia are strongly associated with obesity during pregnancy (Keith et al., 2016). Maternal obesity with greater deposition of adipose tissue within the growing fetus, increase the risk of allergies, also have an impact on fetal brain development and behavioural pattern, leads to autism and ADHD (Keith et al., 2016). The accumulation of environmental factors in egg and sperm of parents contribute a lot to the formation of genetic material to the child. Many lifestyle factors including poor and unhealthy diet, obesity, smoking, drinking and also the age of the parents have an influence on transmitting the signals to the embryo, which in turn increase the risk of metabolic disorders such as diabetes, obesity, cardiovascular diseases, Anxiety, Immune dysfunction etc (Lane, 2014; Robertson et al., 2014). Women with moderate obesity during
pregnancy, have an impact on birth weight and risk of metabolic disorders to their grandchildren leaving the risk of their own children (University of Edinburgh, 2013). Genetic factors of parents, available nutritional status, social and cultural environment of pregnant women have an influence on birth weight of their babies (Rachel, 2016).

1.17. IMPORTANCE OF YOGIC PRACTICES DURING PREGNANCY

The word Yoga is derived from the Sanskrit root Yuj. The meaning is to bind, join, and attach and yoke, to direct and concentrate one’s attention on, to use and apply. It also means union or communion. It means the disciplining of the mind, intellect, the emotions, the will, which yoga presupposes, it means a poise of the soul which enables one to look at life in all its aspects evenly. (B.K.S. Iyengar)

Yoga is one of the six orthodox systems of Indian philosophy. It was coordinated and systematized by Patanjali in his classical work, the Yoga Sutras, which consists of 195 terse aphorisms in which it is stated that yoga is a state where all activities of the mind are channalized in one direction or the mind is free from distractions. (B.K.S. Iyengar.)

1.18. YOGIC CONCEPTS OF HUMAN BODY

The Yoga not only works the physical body by keeping it fit while strengthening and elongating the muscles, it also helps the nervous and circulatory systems by purifying and balancing them. In the past, traditional healers used Yoga postures as a method for healing emotional disorders and illnesses. As a result of regular practice, many benefits will occur. This includes greater endurance,
flexibility, deeper breathing, and an overall improvement in mood and emotional well-being. The traditions of Hatha Yoga provide powerful physical results and are intended to serve as a foundation for the mental and spiritual dimensions of Yoga. Hard work can silence the mind, but has no power to alter or transcend emotional and karmic patterns held in the unconscious mind.

The Asanas promotes flexibility of the muscles and strength in the bones and tissues. It also massages the organs, brings balance to different internal and glandular functions, promotes the flow of vital energy, prana (also known as qi in Chinese, or ki in Japanese), and balances the physical and metaphysical parts of the body (koshas). Asanas are techniques that promote awareness, concentration, meditation, and relaxation through the physical body. As the practice becomes more regular, there are significant results. Such results include good mental and physical health through stretching, massage and the stimulation of the energy channels of the internal organs.

1.19. YOGIC PRACTICES AND HEALTH

Health is the motto of yoga. Many people still think that yoga is a religion; others believe it to be a kind of magic. In reality yoga is a system of physical, mental and spiritual development. Yoga does not mean just twisting and bending of the body. It is a comprehensive mode of culturing the body. It also secures a powerful tool in manifesting the hidden personality of man. Yoga may be the cheapest and most scientific method of ensuring soundness of the body and mind.
Deviations in the spinal column are found commonly in both young and old. Usually these defects originate as functional and later become structural, because no early treatment was provided.

1.19.1. BENEFITS OF YOGA

The practice of Yoga not only works the physical body by keeping it fit while strengthening and elongating the muscles, it also helps the nervous and circulatory systems by purifying and balancing them. In the past, traditional healers used Yoga postures as a method for healing emotional disorders and illnesses. As a result of regular practice, many benefits will occur. This includes greater endurance, flexibility, deeper breathing, and an overall improvement in mood and emotional well-being. The traditions of Hatha Yoga provide powerful physical results and are intended to serve as a foundation for the mental and spiritual dimensions of Yoga. Hard work can silence the mind, but has no power to alter or transcend emotional and karmic patterns held in the unconscious mind.

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Scientific studies have shown that the practice of Yoga has curative abilities and can prevent disease by promoting energy and health. That is why more and more professionals have started using Yoga techniques in patients with different mental and physical symptoms, such as psycho-somatic stresses and different diseases. Our bodies have a tendency to build up and accumulate poisons like uric acid and calcium crystals, just to mention a few. The accumulation of these poisons manifests in diseases and makes our bodies stiff. A regular Yoga practice can cleanse the tissues through muscle stretching and massaging of the internal organs. This brings the waste back into circulation so that the lungs, intestines, kidneys, and skin are able to remove toxins in a natural way.

1.19.2. YOGIC PRACTICES FOR PREGNANT WOMEN

Yoga seeks to restore the condition of wholeness in which, even if a person should experience a spell of misfortune and illness, he nevertheless feels restored to life and healed.

Although yoga is best used as preventive medicine, some of its practices also have great therapeutic value. The word "therapy" comes from the Greek word therapeutic, meaning to heal, to take care of. Yoga can be understood as a comprehensive approach to healing, for it goes to the root of all disease, which is people’s false relationship to life itself. A person falls ill when his body and mind are out of balance, when the life force falls or circulates freely. Ultimately, there can be no complete healing until we have restored our primal trust in life, which alone removes all those obstructions within us that tend to manifest as ill health.
Practicing yoga during pregnancy is one of the healthiest ways to nurture the pregnant woman and the baby. It helps the pregnant woman to be more patient and gentle with our self and gain confidence. During pregnancy, everyday changes and growth is happen to the pregnant woman.

Pregnancy is something most women anticipate. It brings both fear and joy to the parents, joy for family having a baby and fear of the risk that goes with it. Pregnancy is the period from conception to birth. Some women go into labor before the expected date of giving birth, resulting to premature infants.

The practice of yoga can help to prepare the mind and body for labor and birth as this helps to focus concentrates and keep one healthy. The yoga postures are gentle ways of keeping the body activate and supple and minimize the common pregnancy symptoms like morning sickness and constipation. It can also help in ensuring easier labor and smooth delivery by relieving tension around the cervix and birth canal and by opening the pelvis. The breathing techniques can also become handy during labor. It also helps in restoring body shape, uterus, abdomen, and pelvic floor, and in relieving upper back tension and breast discomfort after childbirth. Special care, however, is needed in choosing the yoga poses that will be practiced. Poses that require laying on the back should be avoided.

For the first trimester, standing yoga poses are advised as this will help strengthen the legs, promote circulation, generate energy, and may reduce leg cramps. It is also advisable to do some stretching such as the hamstrings stretch to avoid sciatica. During the second and third trimester, the time spent for practicing the asanas may be reduced to prevent fatigue and overwork. It is also not advisable to practice from the tenth through the fourteenth week of pregnancy since these are
crucial times. Supine poses, backbends, and twisting can be done with modification or if the body is on an incline, the abdomen should not be over stretched. The emphasis of twisting poses should be on the shoulders and the upper back and not on the abdomen. Inversion poses should be avoided though some experienced yoga practitioners usually still feel comfortable doing this until the seventh month.

1.19.3. IMPORTANCE OF YOGA ASANAS

Performing asanas regularly will boost the confidence of the pregnant woman. They make spine strong and flexible, ensure correct posture and establish balance between sympathetic and parasympathetic system.

Regular practice of asanas improves blood circulation, tones up the muscles of spine, abdomen and pelvis which help to support the added weight of uterus.

A woman’s pregnancy, starting from conception, up to delivery can be a stressful period due to various reasons such as physiological, psychological, and emotional conditions, coupled with superstitious beliefs, economic conditions, family traditions etc. All cultures emphasise the fact that the expectant mother’s well-being is an absolutely necessary condition for the well-being of the baby. She needs to be enlightened about her fears, encouraged to adopt the right perspective and emboldened to face pregnancy.

1.20. PHYSIOLOGICAL VARIABLES

1.20.1. BODY MASS INDEX DURING PREGNANCY
Gestational weight gain was associated with increase in abdominal obesity, change in body composition with cardiovascular risk factors. In a prospective study, pregnant women with normal weight gain showed 1 inch excess in waist girth gain compared with non-pregnant women, and overweight black and white women gain 1.5 to 2.5 inches gain in waist girth measurements respectively (Gunderson et al., 2004; Smith et al., 1994).

In a cross-sectional studies, they found that women of childbearing age, having one birth would have drop of 3.5 mg/dl on average plasma high density lipoprotein level, over a period of 10 years, there will be a drop of 3 to 4 mg/dl drop in good cholesterol in primiparous (Pregnant for first time) compared to nulliparous (Non-pregnant) women (Lewis et al., 1996).

Reason behind the alarming effect of gaining too little weight during pregnancy, is that low birth weight of the baby, delay in breast feeding, delayed milestones, or developmental delay with frequent illness. Gaining too much weight than the recommendation will results increase risk of miscarriage, congenital malformations, hypertension, gestational diabetes, pre-eclampsia, anesthetic complications, vaginal birth after cesarean failure, instrumental delivery, macrosomia and maternal death, obesity during childhood and postnatal weight retention (Catalano, 2006) (NVSSBD, 2015). Data suggests that 375 of normal weight women and 64% of overweight women gain more than the recommended weight gain during pregnancy. Monitoring gestational weight gain has a benefit in wide area of adult, obstetric and neonatal healthcare (IOM, 1990)

1.20.2. BLOOD PRESSURE DURING PREGNANCY
The pressure exerted by the blood within the walls of the arteries was known as blood pressure, for normal adult women it should be 120/80 mmhg. During pregnancy it should be 140/85 mmhg. The first number is systolic blood pressure, this is the pressure in the arteries when the heart contracts. The second (bottom) number is diastolic blood pressure, this is the pressure in the arteries, when the heart rests between each heart beat. Normal blood pressure during pregnancy is 140/90 mmhg, if its 140-149/90-99 mmhg considered as mildly high blood pressure, 150-159/100-109 mmhg considered as moderately high blood pressure and 160-169/110-119 mmhg would be considered as severely high blood pressure.

Pre-eclampsia is a condition in which, increased in blood pressure above 149/99 mmhg, or above with protein in their urine during pregnancy. Pre-eclampsia would be associated with pregnancy induced hypertension, proteinuria, it may have potential effects on kidneys, liver, brain and blood clotting system (recover itself six weeks after delivery), damage in placenta affects the blood supply, oxygen and other nutrition to the baby.

In case the pregnant women were treated with anti-hypertensive medicine before pregnancy like Angio-tension converting enzyme (ACM) inhibitors, diuretics should consult with their doctors and change the medicine. It may have potential effects on new born babies.

There was a study, hypothesized that, increase in oxidative stress cause potential damage to the endothelial (cellular lining of blood vessels) cells (Saftlas et al., 2004). Yogic practices have been shown to increase the body’s resistance to
prevent and reduce the oxidative stress and its negative impact on fetus such as obesity and insulin resistance (Yeo et al., 2001).

Preeclampsia is defined as a toxemia of late pregnancy characterized by hypertension, proteinurea (protein in the urine), and edema (Dorland’s pocket medical dictionary, 2009). It is the leading cause of maternal mortality. 15 to 19% of pregnancy related maternal death is due to preeclampsia (Sorensen et al., 2008). The negative effects of preeclampsia cause constriction of blood vessels in the placenta, which in turn reduces the amount of oxygen and other nutrients that are transferred to the fetus, results in growth retardation and premature birth (Meher, 2006)

1.20.3. RESTING PULSE RATE DURING PREGNANCY

Resting pulse rate vary with every individual women during pregnancy, based on their fitness level before pregnancy, age of the pregnant women etc. Resting pulse rate for adult women is 72-75 beats/ minutes. However during pregnancy, most of the mother’s blood supply will be diverted to uterus, in order to pump enough blood supply to other parts of the body, the heart beats extra, this could be the reason for increase in resting pulse rate up to 80 beats/minutes (ACOG, 1994). During yogic practices it has to be maintained at 140 beats/ minutes. However exertion level can be monitored through, rate of perceived exertion scale to measure the intensity that the pregnant women able to speak in the middle of yogic practices, that could be the possible measure of maintaining
the heart rate under control. (Fetal heart rate should be measured separately, an average of 140-150 beats/ minutes (Lisa weber, 2013).

1.21. BIO-CHEMICAL VARIABLES

1.21.1. BLOOD GLUCOSE LEVEL DURING PREGNANCY

The importance of maintaining blood glucose level in normal value is to prevent complications to mother and fetus. Studies suggests that, the weighted average blood glucose levels (+ 1 SD) were 71 + 8 mg/dl fasting, 109 + 13 mg/dl at 1 hour post-prandial and 99 +10 mg/dl at 2 hour post-prandial (care.diabetes journals.org)

Pregnant women with pre existing diabetes fasting blood glucose level should be 60 – 99 mg/dl, post-prandial after 2 hour should be less than 140 mg/dl and average six month values should be less than or equal to 6.0%. During pregnancy if gestational diabetes has been diagnosed, then fasting blood glucose level should be less than 95 mg/dl and post-prandial blood glucose level should be less than 120 mg/dl.

1.21.2. BLOOD GLUCOSE (FASTING AND POST PRANDIAL)

The American Diabetes Association defines Gestational Diabetes Mellitus (GDM) as”any degree of glucose intolerance with onset during pregnancy” (ADA, 2004). Women who are diagnosed with GDM have a 30 to 84% higher risk for developing GDM in following pregnancies. A study of 23,904 women in the United States reported that more than 70% of women with GDM had body mass index of greater than 25 Kg/M². Yogic practices has been shown to reduce the risk
of GDM, by improving glycemic control and also reduce the risk of developing type 2 diabetes in future (Boinpally et al., 2009).

1.21.3. TRIGLYCERIDES, HDL AND LDL DURING PREGNANCY

Pregnancy would be associated with metabolic changes in mother. These cause drastic changes in maternal physiological, bio-chemical and hematological parameters. These changes were reversible if there are no complications (Cunningham, 2005). Towards third trimester, the glucose utilized by the fetus would increase up to 33mmol/kg/min (Sivan, 1999). This increases the demand of energy in growing fetus, which in turn increases the insulin resistance. In addition, increase in the level of estrogen, progestron, human placental lactogen(hpl), human placental growth hormone (hPGH), cortisol, TNF alpha, ILs etc (Ryan, 1988; Wada, 2010; Gonzalez, 2000; Barbour, 2002; Kirwan, 2002) is responsible for insulin resistance, which is associated with development of dyslipidemia in the form of increased level of serum triglycerides, total cholesterol and low density lipoprotein, where as there is a reduction in high density lipoprotein (Kawamoto, 2011; Steinberger, 1995). This transition in lipid profile favors energy sources for growing fetus by sparing glucose and amino acids for the fetus. This helps in building cell membranes, precousor of bile acids and steroid hormones, in addition to this cell proliferation and development of growing body of the fetus.

Even though it has many positive effects on growing fetus, alteration in lipid profiles leads to maternal complications, such as gestational hypertension, gestational diabetes, pre-eclampsia, intrahepatic cholestasis etc. Fetal complications such as, intra-uterine growth retardation, pre-term birth and
macrosomia were most common issues (Nascimento, 2016; Jin WY, 2016). These factors in later part of life may develop diabetes mellitus, hypertension, cardiovascular complications, atherosclerosis etc for the mother.

1.21.4. BLOOD URIC ACID LEVEL DURING PREGNANCY

Normal level of blood uric acid level is 2.4-6 mg/dl (NYU Medical center). Increase level of uric acid is associated with gout, is a form of arthritis. Increase in blood uric acid level in turn increases the chance of gestational diabetes and gestational hypertension, leads to pre-eclampsia (i.e) gestational hypertension associated with proteinuria.

Our body metabolizes substances called purines, which can also be present in the body, through the consumption of some form of diet. Break down of purines create a chemical called uric acid. Human kidneys mostly eliminate all these chemicals through urine output. If the blood uric acid level is above the normal range, which the kidneys cannot excrete through urine, adequately, this leads to increase level of blood uric acid. During first 20 weeks of gestation, if the uric acid level is more than the normal value, it is an indicator that predispose to pre-eclampsia (“Hypertension in pregnancy-Journal”, 2010). Combined effect of gestational diabetes with reduction in insulin level associated with gestational hypertension, pre-eclampsia, proteinuria would increase the blood glucose level in the placental arteries, which supplies the fetus, end up with breathing difficulties after birth, obesity, pre-eclamptic organ damage to fetus if the condition left untreated. Obesity would be the causative factor for all these complications. Reduction in obesity level, with lower body mass index may prevent all these
complications. Eating healthy and nutritious food and keeping them active during pregnancy would help to overcome all these issues.

Food rich in purine content are organ meat, liver, kidneys, sweet breads, brains, beef, pork, lamb, beer. Whereas fish, seafood, oat meal, wheat bran, wheat germ contains moderate levels of purine. Green vegetables, tomatoes, fruits, bread, cereals (not whole grain), butter, buttermilk, chees, eggs, chocolate, cocoa, coffee, tea, carbonated beverages, peanut butter and nuts contains low level of purines. Low fat, non-fat milk and yogurt contains very low level of purine (webmed, 1995-2015).

1.22. PSYCHOLOGICAL VARIABLES

1.22.1. PERCEIVED STRESS LEVEL

Our day to day life causes people to push their mind and body to the extreme limit, often at the expense of physical and mental wellbeing. According to the Mind/Body medical institute at Harvard University, 60 to 90% of all medical office visits in the United States are for stress related disorders. Stress has damaging effects on health and the immune system. Relaxation techniques were helpful tools for coping with stress and promoting long-term health by slowing down the body and calming the mind. These relaxation techniques help to increase body awareness and improve the attention.

When we become stressed, our bodies engage in “fight-or—flight response”. The fight-or-flight responses refer to changes that occur in the body when it prepares to either fight or run. These changes include increased heart rate, blood pressure and respiratory rate, and a 300 to 400% increase in the amount of
blood being pumped to the muscles. These changes over a period of time results in increase level of cholesterol, disturbed intestinal activities and depress the immune system. The term, relaxation technique, first coined in the mid 1970s by a Harvard cardiologist named Herbert Benson, refers to changes that occur in the body when it is in a deep state of relaxation. These changes include decreased blood pressure, heart rate, muscle tension and respiratory rate, as well as feelings of being calm and in control.

Research suggests that meditation can help to improve a person’s quality of life and reduce stress hormone levels. Clinical studies also show that relaxation techniques reduce the perception of pain. One clinical study found that among patients undergoing colorectal surgery, those who listened to guided imagery tapes before, during and after the operation had less pain and needed fewer pain medications than those who did not. Another found that relaxation practices, such as deep breathing, progressive relaxation, and visualization enhanced the immune response among breast cancer patients.

Pregnancy is a sensitive period for a woman’s health, both physical and psychological. Due to the change in physiology of her body and secretion of new hormones can affect the pregnant woman’s mood and emotional status (Ahokas et al, 2005). Last few decades, researchers mostly focused on postnatal depression, than antenatal depression (Giovani et al, 2014). Studies from different countries have estimated the prevalence of antenatal depression to range from 6 to 38%. Pregnant women have all possibilities to suffer from mood disorders compared to non-pregnant women (Dietz et al, 2007). Antenatal depression has often been found to be more frequent than postnatal depression, and twice often (Field, 2011).
Many studies show that the first and last trimester of pregnancy are at the highest risk periods for developing mood disorders (Gavin et al, 2005).

Mood disorders throughout pregnancy may lead to complications like pre-eclampsia, spontaneous miscarriage, and poor outcomes for the offspring such as intra-uterine growth retardation, placental abnormalities, low birth weight, pre-term birth, and frequent admission to the neo-natal intensive care unit (Bonari et al, 2004; Deave et al, 2008; Field et al, 2006; Grote et al, 2010).

It has been proved that the neonates of mothers suffering from mood disorders during pregnancy perform poorly on many clusters of the Brazelton Neonatal Behavioral Assessment Scale (NBAS) such as orientation, reflex, excitability, and withdrawal; they were also more aroused and less attentive (Hernandez et al, 2006; Hollins, 2007; Lundy et al, 1999).

The reluctance of pregnant women to take antidepressant drugs, due to the ill effects of antidepressants like intrauterine fetal death, physical malformations, growth impairment, behavioral teratogenicity, and neonatal toxicity, have lead the clinicians to suggest the patients to approach psychological interventions or alternative forms of treatments such as light therapy, massage therapy, or omega-3 fatty acid supplementation (Dennis et al, 2007; Dennis and Allen, 2010).

There is very little evidence to support that alternative therapies were the best choice for antenatal mental illness, rather than drugs. At present there are no recent systematic reports on the newborn focusing on neurodevelopment (Chaudron et al, 2005), rather than poor neonatal adaptation syndrome or similar reaction at births (Grigoriadis et al, 2013).
1.22.2. ANXIETY

Body’s biochemical dysregulation during pregnancy may lead to anxiety, which increases blood pressure and uterine artery resistance, which results in fetal distress, if this issue is not addressed, it may cause maternal and fetal death (Dipietro et al., 2002).

Ravinder Jerath et al, (2015) suggests that understanding the autonomic nervous system and homeostatic changes associated with emotions will be a major challenge for neuroscientists and a fundamental pre-requisite to treat anxiety, stress and emotional disorders. They proposed that these breathing techniques could be used as first-line and supplemental treatment for stress, anxiety, depression and some emotional disorders rather than targeting neurotransmitters with medication would be a superior method to address these issues.

In the United States, it is estimated that the prevalence of ante-natal depression reaches 10-20% (Fellenzer and Cibula, 2014). Depressive episode during pregnancy is a serious threat to the wellness of pregnant women, indicated an ante-partum depression rate of almost 20%, which is twice as that of 11% after delivery (DeTychey et al, 2005). There are very less number of literatures on prenatal depression, than that of postnatal depression. Pre-natal depression has a negative influence on physical and mental health of both mother and fetus (Glover et al, 1997). Some of the major complications of prenatal depression were associated with lower birth weight of babies associated with elevated resting heart rates, increased risk of developmental delays, pre-term babies, increased physiological reactivity, behavior problems in childhood and adolescence, than that of the children of non-depressed mothers (Bruijin et al, 2009). Prenatal
depression will be a strong risk factor for developing post-natal depression. Traditional method of treating prenatal depression with anti-depressants was considered to increase the risk of postpartum hemorrhage and affects the unborn child too (Kieler et al, 2012).

Psychotherapy, complementary and alternative medicines were considered safe and effective, has been used extensively for the treatment option for antenatal depression (Cohen et al, 2006). Indian methods of treating antenatal depression with ethical disciplines, physical postures and spiritual practices in turn contribute to deep relaxation in which the body and mind experience deep sense of calmness (Alwan et al, 2011). They focused on reduction of perceived stress during pregnancy, enhancement of immune function, improvement in adaptive autonomic response to stress etc. (Muthukrishnan et al, 2016). There was remarkable improvement noticed in gestational age and birth weight of fetus. With improved maternal comfort during delivery, facilitated normal delivery and reduced labor duration with reduction in the requirement of anesthesia (James, 2003). Another meta-analysis focused on exercise for antenatal depression and a significant reduction in depression scores (SMD- 0.46, 95% CI- 0.87 to 0.05, p=0.03, I² =68%) for exercise intervention relative to the comparison group (Daley, 2015).

Integrated yogic programs may be an effective treatment option in alleviating antenatal depression, with the study results shows that the intervention group showed significant improvement in reduction of antenatal depression compared to control group (Satyapriya et al)

1.23. OBJECTIVES OF THE STUDY
• The study will help to find out the effect of yogic practices with and without diet modification on selected physiological variables like resting pulse rate, systolic and diastolic blood pressure and Body mass Index among pregnant women.

• The study will help to find out the effect of yogic practices with and without diet modification on selected biochemical variables like blood sugar (fasting and post prandial), Blood lipid profile (Triglycerides, HDL, LDL) and Uric acid among pregnant women.

• The study will help to find out the effect of yogic practices with and without diet modification on selected psychological variables like stress and Anxiety among pregnant women.

1.24. REASON FOR SELECTION OF TOPIC AND VARIABLES

To prevent complications during pregnancy, we need to focus on nutritional status and physical activity, which is beneficial for pregnant mother and growing fetus (WHO, Maternal mortality 2016). The health status of women during pregnancy is directly proportional to the health of Newborn babies. Having healthy food during pregnancy and regular exercise for an hour a day for five to six days a week would help to reduce the risk and complications during pregnancy, which in turn improve the success rate of healthy babies. Many women die during pregnancy or following childbirth due to various reasons, most important among them were severe bleeding, infections, high blood pressure, anemia etc. which can be addressed earlier and treated with careful monitoring if known before. Interventions should be found on directing the parent's health in advance, during pre-conception assisting them to lead a healthy life will not only improve their
lifestyle, but also the health of their children (University of Southampton, 2016).

Hence the aim of the present study was to investigate the effects of yogic practices with and without diet modification on selected physiological, bio-chemical and psychological variables among pregnant women.

1.25. STATEMENT OF THE PROBLEM

The purpose of the present study was to investigate the effects of yogic practices with and without diet modification on selected physiological, biochemical and psychological variables among pregnant women.

1.26. HYPOTHESIS

The following were hypothesized for this study:

4. It was hypothesized that there would be significant difference on selected physiological, bio-chemical and psychological variables due to yogic practices with diet modification group among pregnant women than the control group.

5. It was hypothesized that there would be significant difference on selected physiological, bio-chemical and psychological variables due to yogic practices without diet modification group among pregnant women than the control group.

6. It was hypothesized that there would be significant difference on selected physiological, bio-chemical and psychological variables due to yogic practices with diet modification group among pregnant women than yogic practices without diet modification group.
**1.27. SIGNIFICANCE OF THE STUDY**

This study is significant in the following ways:

7. The findings of this study would create interest among future researchers to make further studies on this area.

8. This study would bring out the importance of yogic practices among pregnant women.

9. This study would bring out the importance of diet modification outcome among pregnant women.

10. This study would give adequate knowledge about the influence of yogic practices and diet modification among pregnant women.

11. This study would describe the changes in physiological, bio-chemical and psychological variables due to yogic practices and diet modification among pregnant women.

12. The findings of the study would be helpful for the further research studies, also helpful for the pregnant women.

**1.28. DELIMITATIONS**

7. The study was delimited to Chennai city, Public Health Centres only.

8. The study was delimited to 60 pregnant women randomly selected from different maternity centres only.

9. This research confined among women in the age group of 21 to 28 years only.

10. The study was delimited to five days a week (Monday to Friday), between 6.30 am to 8 am only.
11. The study was delimited to independent variables such as yogic practices and modified diet pertaining to pregnancy only.

12. The study was delimited to dependent variables such as physiological variables namely body mass index, blood pressure (systolic & diastolic), resting pulse rate, bio-chemical variables namely blood sugar level (fasting & post-prandial), triglycerides, high density lipoprotein, low density lipoprotein and blood uric acid level, psychological variables namely perceived stress and anxiety only.

1.29. LIMITATIONS

1. Factors like personal habits, life style, daily routine and climatic condition that may have influence on variables will be recognized as a limitation.

2. The heredity contributes to both physical and mental efficiency will not be controlled.

3. The previous experience of the subjects will not be considered in this study.

4. Sociological aspect of their day to day life, interaction with their environment will not be considered.

5. General activity, motivation of the subjects and factors that affects metabolic function is beyond the control of the researcher.

6. Though the subjects will be motivated verbally, no attempt will be made to differentiate the motivation level during the period of testing.
7. Stress factors related to family, environment and workplace might be influencing the study can be considered as limitation.

1.30. MEANING AND DEFINITION OF TERMS

1.30.1. YOGIC PRACTICES

The term “yoga” comes from a Sanskrit word meaning “union”. Yogic practices were a combination of physical postures to strengthen the muscles, meditation to relieve stress, and breathing techniques to improve the heart and lung function (Caldwell, 2005).

The term yoga comes from a Sanskrit word which means yoke or union. Yoga is a method of joining the individual self with the divine, Universal spirit, or cosmic consciousness (SwamisathyanandaSaraswathi).

1.30.2. DIET

In nutrition, diet is the combination of food consumed by a person. The word diet indicates the use of specific intake of nutrition for health reasons. Complete nutrition includes ingestion and absorption of vitamins, minerals, and food energy in the form of carbohydrates, proteins and fats. In order to have a better quality of life and to achieve health and longevity, clean dietary habits should be followed (askoxford.com).

1.30.3. BODY MASS INDEX
The body mass index (BMI) is a measure of someone's weight in relation to their height. The BMI is equal to a person's weight divided by their height. It is calculated as:

\[
\text{BMI} = \left( \frac{\text{Weight in kilograms}}{\text{Height in meters}^2} \right) \quad (\text{NHLBI, 1998}).
\]

1.30.4. BLOOD PRESSURE

Pressure that is exerted by the blood upon the walls of the blood vessels and especially arteries and that varies with the muscular efficiency of the heart, the blood volume and viscosity, the age and health of the individual, and the state of the vascular wall (Merriamwebster, 1854)

1.30.5. SYSTOLIC BLOOD PRESSURE

The blood pressure when the heart is contracting. It is specifically the maximum arterial pressure during contraction of the left ventricle of the heart (medicinenet.com).

1.30.6. DIASTOLIC BLOOD PRESSURE

The lowest arterial blood pressure of a cardiac cycle occurring during diastole of the heart called also diastolic pressure (medicinenet.com).

1.30.7. RESTING PULSE RATE

Resting heart rate (RHR) is the number of times the heart beats per minute while at complete rest. It is an indicator of physical fitness the resting heart rate
decrease when the heart becomes stronger with aerobic exercise training. A healthy resting heart rate for adults is 60 to 80 bpm (www.verywell.com, 2017).

1.30.8. BLOOD GLUCOSE

Blood sugar, or blood glucose, is sugar that the bloodstream carries to all the cells in the body to supply energy. Blood sugar or blood glucose measurements represent the amount of sugar being transported in the blood during one instant (Christian Nordqvist, 2017).

1.30.9. FASTING BLOOD GLUCOSE

A test to determine how much glucose (sugar) is in a blood sample after an overnight fast. The fasting blood glucose test is commonly used to detect diabetes mellitus. A blood sample is taken in a lab, physician's office, or hospital. The test is done in the morning, before the person has eaten. The normal range for blood glucose is 70 to 100 mg/dl. Levels between 100 and 126 mg/dl are referred to as impaired fasting glucose or pre-diabetes. Diabetes is typically diagnosed when fasting blood glucose levels are 126 mg/dl or higher (medicinenet.com).

1.30.10. POSTPRANDIAL BLOOD GLUCOSE LEVEL

A 2-hour postprandial blood glucose test measures blood glucose exactly 2 hours after eating a meal, timed from the start of the meal. By this point blood sugar has usually gone back down in healthy people, but it may still be elevated in
people with diabetes. Thus, it serves as a test of whether a person may have diabetes, or of whether a person who has diabetes is successfully controlling their blood sugar (www.webmd.com).

1.30.11. LIPID PROFILE

Lipid profile: A pattern of lipids in the blood. A lipid profile usually includes the levels of total cholesterol, high-density lipoprotein (HDL) cholesterol, triglycerides, and the calculated low-density lipoprotein (LDL) 'cholesterol (medicinenet.com).

1.30.12. HIGH DENSITY LYPOPROTEIN

A lipoprotein of blood plasma that is composed of a high proportion of protein with little triglyceride and cholesterol and that is correlated with reduced risk of atherosclerosis called also good cholesterol (Merriamwebster, 1954).

1.30.13. LOW DENSITY LYPOPROTEIN

A complex of lipids and proteins that transport cholesterol in the blood, which is in high concentration, and is associated with increased risk of atherosclerosis and coronary heart disease (dictionary.com, 2017)

1.30.14. TRIGLYCERIDES
Triglycerides: The major form of fat stored by the body. A triglyceride consists of three molecules of fatty acid combined with a molecule of the alcohol glycerol. Triglycerides serve as the backbone of many types of lipids (fats). Triglycerides come from the food we eat as well as from being produced by the body. Markedly high triglyceride levels (greater than 500mg/dl) can cause inflammation of the pancreas (pancreatitis). Therefore, these high levels should be treated aggressively with low fat diets and medications, if needed (medicinenet.com).

Fatty compounds synthesized from carbohydrates during the process of digestion and stored in the body’s adipose tissues. High levels of triglycerides in the blood are associated with insulin resistance (Collins Dictionary of Medicine, 2004, 2005).

1.30.15. BLOOD URIC ACID LEVEL

Uric acid: A breakdown product of purines that are part of many foods (medicinenet.com). During early pregnancy serum uric acid levels fall, often to 3 mg/dl or below, related to the uricosuric effects from estrogen and from the increase in renal blood flow. Uric acid levels then increase during the third trimester, reaching levels of 4–5 mg/dl by term (Kang et al., 2004).

1.30.16. STRESS

Stress is defined as “a state of psychological and physiological imbalance resulting from the disparity between situational demand and the individual's ability
and motivation to meet those needs.” “The rate of all wear and tear caused by life.”

(Hans Selye, 2011)

1.30.17. ANXIETY

Anxiety is an emotion characterized by feelings of tension, worried thoughts and physical changes like increased blood pressure. People with anxiety disorders usually have recurring intrusive thoughts or concerns. They may avoid certain situations out of worry (www.apa.com).

Pregnancy anxiety is a particular emotional state tied to pregnancy-specific concerns, such as worries about the health of the baby and childbirth. A growing body of research demonstrates that pregnancy anxiety is an important risk factor for preterm birth and other adverse birth and child development outcomes (Chrisdunkelschetter, 2014).