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A Review of Risks at Different Gestational Stages: Teratogenic Effects of Dietary Intake During Pregnancy

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Abstract: *Advice for pregnant women on food avoidance, dangerous exposures, and inappropriate behavior is in large quantity on the internet and through various information sources. This reviews the evidence base for such advice and clarifies issues where common advice is not supported by credible data. Foods containing potential teratogens, mutagens or toxicants that need consideration include liver (high vitamin A), some herbal teas, contaminated grains, predatory fish, caffeine-containing foods, and various sources of foodborne infections. Restrictive diets and unusual dietary cravings need to be properly managed. Evidence for harm from personal care products is generally weak, but pregnant women may choose to avoid some unnecessary exposures. The basis of this review was 'to implicate the teratogenic effects of foods. That is the behavior or functional variation of the offspring to its environment.*

Keywords: Teratogenic foods , pregnancy , fetal damage , teratogens , growth retardation , matetnal consumption, trimester, malformation, congential disabilities

I. INTRODUCTION

Teratogenicity is a defect in a developing fetus. It is a potential side effect of various drugs and foods. Teratogenicity also known as reproductive toxicity. It refers to the occurrence of biologically adverse effects on the productive system that may result from chemical exposure to several environmental agents. Fetal damage such as growth retardation, dysplasia, goitre or the asymmetric. Teratology is the study of abnormal development in embryos and causes birth defects. The reproductive toxicity includes the death of the developing organism, structural abnormality, altered growth, and functional deficiency. During the first two weeks of gestation, teratogenic agents usually affect the embryo. There are basic cell behaviour during embryo development that may serve as targets for exposures . Teratogenicity depends on the capacity of the agent to cross the placenta. The original focus of this work was on physical malformations and more recently has referred to malformations that result from exposure to foods and chemicals. The present view-point is to explore and review the teratogenic mechanism and common teratogenic effects of teratogenic foods'.

Post-partum outcomes for mother and child are linked to maternal consumption habits during pregnancy. Thus, it is imperative that pregnant women must be informed of the risks and benefits of certain dietary practices. This is not a simple task, as many foods, beverages and medications carry unknown risks. Reduced maternal nutrition has been associated with hypertension and altered nephrogenesis in the offspring. These studies demonstrate that a healthy balance of nutrients play an important role in normal developmental biology.

II. DEVELOPMENT OF INFANT

The first trimester: The first trimester is the first 12 weeks of the pregnancy, and it is a crucial time for fetal development. The fetus by the end of the first 12 weeks:-

-All the body's major organs and structures have begun to develop.
-The heart is beating regularly.
-Fingers and toes have formed.
-The fetus is around 3 inches (in) long and weighs nearly 1 ounce.
-The nerves and muscles work together, and the fetus can make a fist.

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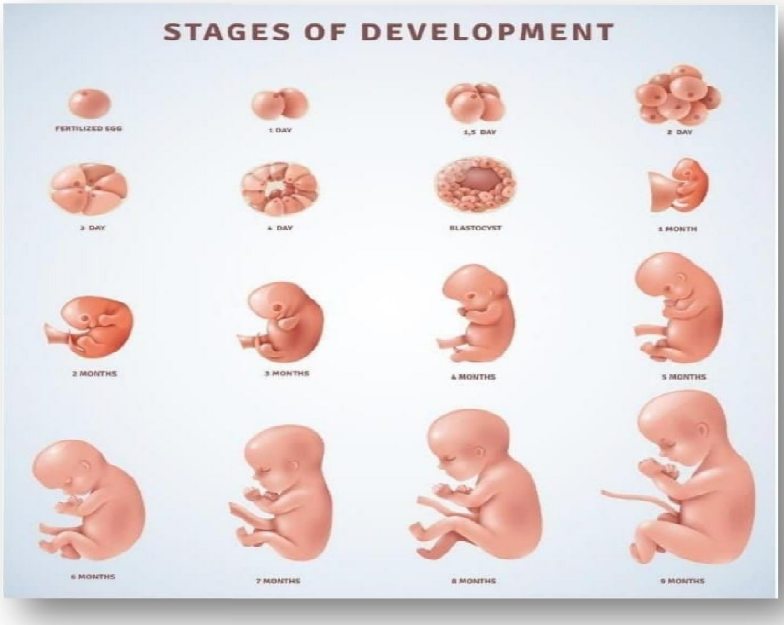
-The eyelids have formed and will remain closed until around week 28, to protect the eyes.

The second trimester: Weeks 14–27 are the second trimester. The fetus goes through many changes during this time, growing to be around 1 foot long and weighing 1.5 pounds.The fetus by the end of the second trimester, the following will have happened:

-Meconium, the first bowel movement, has developed in the intestines.
-The fetus can see, hear, make a sucking motion, and scratch itself.
-Skin, hair, and nails have formed.
-The lungs have formed but do not yet work.
-The fetus is sleeping and waking regularly.
-A male's testicles will have moved to the scrotum, and a female's eggs will have formed in the ovaries.
-Taste buds have formed.
-Bone marrow is making blood cells.
-Lanugo, which is fine hair, covers the body.

The third trimester: The third trimester lasts from week 29 until delivery, which is usually around week 40.Most organs and body systems have formed by now, and they will continue to grow and mature. During this trimester:

The bones are hardening.
Movements become more noticeable.
The eyes are open and can sense light.
Lung formation becomes complete.
Lanugo falls away, and a waxy coating, called vernix, develops.



III. HISTORY OF TERATOLOGY

Teratology, the study began as a modern science in the 1930s, with publication of a set of experiments in which pregnant pigs which were fed a diet deficient in vitamin A. The resulting abnormalities in the offspring proved that mammalian development, by its residence within the mother, was not as protected as was previously believed. In fact, the results of these experiments proved that relatively simple alterations in the environment and diet could have adverse effects on the embryo.

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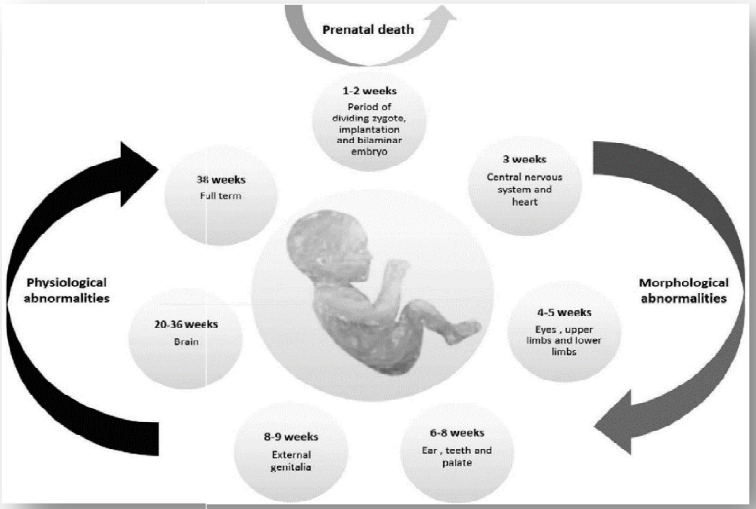
As congenital disabilities are detected, medical professional must consider most congenital disabilities stem from teratogens . The first human teratogen identified in 1941 by an ophthalmologist, Norman Gregg, was maternal rubella infection in pregnancy, which created a defects (heart malformations, and deafness) in the infants.



IV. PRINCIPLE : CAUSES OF DEFECTS

Defects can be attributed to a variety of causes (Table I). Sixty-five percent to seventy percent of all birth defects are classified as having an unknown etiology. Approximately 20% are genetic in nature; and chromosomal, or cytogenetic, defects account for 3% to 5%of all congenital malformations. These include problems Such as trisomy (the inheritance of a complete extra chromosome) or the 4p-syndrome (alteration of a small part of the chromosomal complement). Two percent to three percent of developmental defects are due to maternal infection with viral agents . A small percentage of birth defects are caused by imbalances in maternal metabolism, such as that related to diets. Between 2% and 3% of defects are classifies teratogen-induced malformations.

Cause.	%
Teratogen-induced malformations	2-3
Maternal infection with viral agents.	2-3
Chromosomal defects.	3-5
Genetic factors.	20
Unknown.	65-70

TABLE I. Causes of birth defects.

GENERAL MODE OF ACTION :

Mammalian fetal development passes throughout three main phases: blastocyst formation, organogenesis, histogenesis and maturation of purpose. Many teratogens have capacity to inhibit cell division and kill embryo during cell division, which was implicated in blastocyst formation. Administration of teratogen during the period of organogenesis (Day 17-60) leads to malformations. The type of malformation produced by teratogen involves defect in eye and brain, skeleton and limbs, heart and major vessels, palate, and genitourinary system.

FOODS AS TERATOGENS

SUGARY FOODS : Frequent consumption of sugary desserts during pregnancy may contribute to increased likely-hood of gestational diabetes mellitus (GDM), a condition of glucose intolerance that has been implicated in many pregnancy problems including macrosomia, large for gestational age (LGA) infants, and increased rates of cesarean delivery and problems with gestational glucose control have been associated with neural tube defects . On the other

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hand, carbohydrate restriction has been shown to aid in maternal glycemic control, alleviating some of the adverse pregnancy outcomes seen in patients with GDM More than a third of women (37%) ate sweet desserts more than one time per week, and 13.3% ate desserts more than 4 times per week. Of course, women with GDM should be advised to closely monitor their sugar intake during pregnancy.

Teratogenic Effects:

High sugar intake can lead to rapid weight gain in newborns, increasing the risk of childhood obesity and associated health issues later in life.

Disrupt the baby's natural appetite regulation.

ALCOHOL : Alcohol affects the fetus's central nervous system. Drinking alcohol during pregnancy increases the fetus's risk for fetal alcohol syndrome. Fetal alcohol syndrome is a disorder that can cause physical and behavioral disabilities. It is in the third week after fertilization that specific alcohol-induced birth defects begin to affect the developing embryo. There's no amount of alcohol intake that's considered safe during pregnancies.

Teratogenic Effects:

Slow physical growth before and after birth.

Delayed development, including taking longer to reach milestones, such as sitting, talking and walking.

Smaller than average head and brain size.

Facial features such as small eyes, a thin upper lip, and a smooth philtrum (the groove between nose and upper lip)

Vision or hearing problem.

CAFFEINE : Caffeine is a xanthine alkaloid that can be found in coffee, sodas, energy drinks, and tea. Studies labeling caffeine as a teratogen date back to the late 1960s and in 1980, the FDA advised limiting intake of caffeine during pregnancy, noting the substance's association with fetal mortality, birth defects, and decreased birth weights The American Pregnancy Association recommends 150-200 mg as a safe daily dose of caffeine, although this is only based upon studies concerning risk of miscarriage . High amount of coffee consumption have been linked to fetal death after the second trimester .

Teratogenic Effects:

It takes a long time for the frontal lobe to develop compared to other regions of brain, and with excessive accumulation of caffeine, there's a possibility that the development of the frontal lobe is slowed down Embryonic caffeine exposure at mid-term stages has been shown to change fetal cardiac DNA methylation patterns, leading to adult cardiac defects .

Increased fussiness and irritability. More trouble going to sleep or staying asleep.

NEEM: Neem is well known for its medicinal properties. You might have seen elderly people chewing neem leaves to boost their immunity. Pregnancy is the time women require high immunity to ward off common infections. But is it safe to eat neem during pregnancy?

According to Ayurveda, expecting mothers should refrain from eating neem during their first five months of pregnancy. This is because neem tends to generate more body heat.A spike in the body temperature of the mother is not good for the developing fetus. Too much heat generation can end up in a miscarriage. This is because as the body temperature increases, the body may consider the developing fetus as a foreign body and tends to eliminate it. This can end up in miscarriage.

However, if you ingest a small quantity of neem accidentally or by mistake there is no need to panic. More often, it might not have any adverse effect. Only intake of a large quantity of neem extract at once or consuming a significant quantity for a prolonged period will trigger all the ill effects.

SEAFOOD: Seafood, which includes fish and shellfish, can be a great source of protein, iron and zinc. These are important nutrients for your baby's growth and development. The omega-3 fatty acids in many fish, including docosahexaenoic acid (DHA), also can help with your baby's brain development. But some types of seafood can have high levels of mercury. These include large, predatory fish such as shark, swordfish, king mackerel and tilefish. And canned chunk white tuna also called albacore tuna may be higher in mercury than canned light tuna. Although the mercury in seafood isn't a concern for most adults, special precautions apply if you're pregnant or planning to become

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pregnant. **If you regularly eat fish high in mercury, mercury can build up in your bloodstream over time. Too much mercury in your bloodstream could damage your baby's developing brain and nervous system.**

Other guidelines for seafood during pregnancy:
Avoid large, predatory fish: To lower your exposure to mercury, don't eat shark, swordfish, king mackerel or tilefish.
Skip uncooked fish and shellfish: To avoid harmful bacteria or viruses, don't eat fish and shellfish that has not been cooked. That includes oysters, sushi, sashimi, and refrigerated seafood .
Understand local fish advisories: If you eat fish from local waters, pay attention to local advisories.
Cook seafood properly: Most seafood should be cooked to an internal temperature of 145 degrees Fahrenheit (63 degrees Celsius.

UNPASTEURIZED MILK : Any raw milk product that is not pasteurized (has not heated to a high temperature to kill microbes) can carry disease-causing microbes. The worry of these is the bacterium Listeria monocytogenes, which can cause an infection called listeriosis. As explained in babycenter Pregnant women are particularly susceptible to it, and the infection can be devastating and even deadly for unborn babies. Pregnant women run a serious risk of becoming ill from the bacteria Listeria, which are often found in raw milk and can cause miscarriage, or illness, or death of the newborn baby.Some states ban the sale of raw milk, and most others restrict it to direct farm sales. But several states do allow stores to sell raw milk with warning labels. And in some states, you can find cheese made from raw milk on store shelves and at farmer's markets, so it's best to check the label for the word "pasteurized" before consuming.

UNRIPE PAPAYA : Papaya is known as “angel in fruits," Eating papaya in pregnancy is okay, but it should be ripened enough otherwise, which can lead to miscarriage. Since papaya has multiple health benefits, it is recommended to consume it during pregnancy. A woman can always have a cup of papaya to induce periods when it is delayed. But when it comes to pregnancy, one cannot take any chance because pregnancy is a phase where every woman enjoys and looks forward to meeting their little ones. Our grandparents and parents have advised us not to eat certain foods during pregnancy, and papaya is one of those foods that many people believe can cause miscarriage.

Eating ripe papaya is good and benefits pregnancy, but unripe and semi-ripe papayas are not good. Unripe papaya features a component called papain and latex. The presence of latex in papaya is papain, which your body may perceive as the prostaglandins that may encourage labour, which can often lead to miscarriage.**The presence of papain in unripe papaya is not good for the fetus**. It weakens the membrane which is around the fetus.

WILD APPLES: Pregnant women should avoid having wild apples during pregnancy. Their acidic and sour properties may induce the uterus to contract and lead to premature labour or a miscarriage

ALOE VERA : Aloe vera is known for its numerous health benefits. There are instances of pregnant women deliberately eating aloe vera during pregnancy. This is a wrong thing to do as aloe vera comprises of anthraquinones, a kind of laxative that induces contractions of the uterus and pelvic bleeding. This, in turn, leads to a miscarriage. That said, aloe vera gel, when applied to the face, is not unsafe during pregnancy.

SPICES : While certain spices have complex nutrition that you and your child needs, some other are not that good for you, in fact, they may turn out to be unsafe.Spices you must eat during pregnancy!Some spices are simply too healthy to take while pregnant. You and your child will both benefit from eating a few of those spices.**Spices add flavour to dishes. But certain spices like fenugreek, asafoetida, garlic, angelica, and peppermint are best avoided during pregnancy**. These spices can stimulate the uterus, and result in contractions, preterm labour and miscarriage. They may also cause blood thinning and bleeding during pregnancy.

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V. CONCLUSION

Our main findings are summaries as percentages of women reporting consumption of unhealthy foods and beverages during pregnancies. We also found that large percentages of pregnant women reported eating high sugar sweet desserts and high fat and salt fast foods more than once a week.

These data reflect a remaining risk in certain populations for adverse outcomes in fetal development. Prenatal medical professionals should discourage the consumption of dangerous foods, beverages, and medications that women commonly report consuming during pregnancy.

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