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“The effect of Diagnostic X-rays on the Fetus (between 8–15 weeks) During pregnancy among females in Makkah, KSA”

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Abstract

Researchers in Makkah, KSA, want to draw some conclusions on how diagnostic X-rays affect unborn children. Diagnostic imaging of pregnant women is on the rise despite healthcare practitioners' awareness of the risks to embryonic and fetal health from radiation exposure. For tertiary data collection, relevant literature was perused. This evaluation included particular radiation effects on pregnant women and their unborn children, X-ray hazards according to gestational age, and other possible health impacts of diagnostic imaging techniques on pregnant women. To further address ethical concerns, we have worked to improve communication in order to reduce the amount of radiation that pregnant women and their unborn children are exposed to.

Keywords: Diagnostic imaging; embryo; fetus; pregnant women; radiation risk; radiology; X-ray.

المستخلص:

تهدف الدراسة إلى اقتراح تأثير الأشعة السينية التشخيصية على أجنة الحوامل بين النساء في مكة المكرمة، المملكة العربية السعودية. لقد أقر مقدمو الرعاية الصحية بمخاطر التعرض للإشعاع على صحة الجنين، ومع ذلك فإن التصوير التشخيصي للنساء الحوامل آخذ في الازدياد. تمت مراجعة الأدبيات المتعلقة بالموضوع محل الاهتمام لجمع البيانات الثانوية. تمت مناقشة التأثيرات المحددة للإشعاع على النساء الحوامل والجنين، ومخاطر الأشعة السينية اعتمادًا على عمر الحمل، والآثار الصحية المحتملة الأخرى عند إجراء إجراءات التصوير التشخيصي على النساء الحوامل في هذه المراجعة. بالإضافة إلى ذلك، تم النظر في القضايا الأخلاقية من خلال تحسين الاتصال الشامل لتقليل التعرض غير الضروري للإشعاع للنساء الحوامل والأجنة.

الكلمات المفتاحية: التصوير التشخيصي؛ الجنين؛ الجنين؛ النساء الحوامل؛ مخاطر الإشعاع؛ الأشعة؛ الأشعة السينية.

Introduction

The total amount of radiation exposure during medical treatments has grown over the last quarter of a century, mostly as a result of technical advancements (Mettler, et al.2009). According to a publication in the Radiation Safety Compliance Journal by the American Society of Radiologic Technologists, the total cumulative dosage has nearly quadrupled since the early 1980s. Actually, medical imaging accounts for almost 90% of all artificial radiation exposure; computed tomography (CT) is the leading cause of the rise in ionizing radiation (Hricak, et al.2011). Healthcare practitioners need to have a thorough understanding of the advantages and disadvantages of diagnostic imaging since it exposes patients to radiation. Diseases can be better understood with the use of diagnostic imaging. A pregnant woman's body goes through constant transformation and is more vulnerable to a host of illnesses (Koth, & Smith, 2016).

Pregnant mothers and their unborn children both benefit from accurate medical diagnosis and the administration of appropriate medicine. Radiologists, doctors, and other medical professionals need a clearer picture of the pros and cons of diagnostic radiation exposure to pregnant women before they can make informed judgments. In a 2013 study, Murray and McKinney for example, according to Salvi and Salvi (2015), pregnant women can be exposed to primary radiation from abdomen X-rays and scatter radiation from chest X-rays. Radiation doses may be tiny, but the dangers mount with cumulative exposure, exposure frequency, and patient age (Peck, & Samei, 2017; Reston, 2013).

The dangers of X-rays to the developing baby change with the stage of pregnancy at which the mother is exposed (McCollough, et al.2007). Radiation exposure from the eighth to fifteenth weeks of gestation is associated with the greatest risk of fetal malformations (Streffer, et al., 2003). When a pregnant woman's belly is exposed to the main radiation beam, she has the worst radiation consequences. Animal and human research have demonstrated that low-level radiation can also produce fetal effects, which in turn can raise the chance of childhood cancer. Scatter radiation is not dangerous enough to harm a developing embryo or fetus, according to most medical professionals. Embryos and fetuses are protected from scatter radiation by the double shielding, but even a lesser dose of radiation might harm them. Radiologists and doctors must weigh the pros and cons of medical X-ray imaging before deciding whether or not to subject a patient to radiation.

Problem of the study:

The ICRP defines the embryo/fetus from the radiation protection perspective, for both radiation workers and patients as members of the public in their own right, and thus subject to radiation protection legislation on that basis. ICRP Publication 84 (ICRP 2000) states ‘in situations involving a patient or worker, who is known or suspected to be pregnant, the situation includes not only the risk to the mother but to the fetus as well. In this setting, the mother has a role-related responsibility to care for her unborn child as well as to make decisions about herself’. The ICRP (ICRP 2007) recommends that pregnant medical radiation workers may work in a radiation environment as long as there is reasonable assurance that the fetal dose can be kept below 1 mSv during the course of pregnancy. Consequently, high and moderate exposures rarely occur in the occupational setting but potential doses from accidents may be significant.

Every effort should be made to minimize the deliberate use of ionizing radiation in medicine and to explore alternate imaging or therapy methods wherever possible that do not include it. It should be mentioned that radiation accidents and occurrences outside of medical settings can potentially expose pregnant women to significant doses. An appendix to the 2008 report of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR 2008) discusses radiation incidents, some of which affected pregnant women.

This study examines the effects of radiation on the embryo and foetus from low, moderate, and high doses, as well as any evidence that pregnant women react differently to radiation, mostly in medical contexts. In addition, we offer a synopsis of the limitations and factors that must be considered if medical radiation exposure is necessary during pregnancy.

Question of the study

What is the effect of Diagnostic X-rays on the Fetus among Pregnant women (between 8–15 weeks) in Makkah, KSA?

Aim of the study

- To assess awareness and knowledge of the effect of Diagnostic X-rays on the Fetus Among Pregnant women (between 8–15 weeks) in Makkah, KSA

Significance of the study

- The aim is to avoid harm to the developing embryo/fetus principally from stochastic risks such as cancer at low dose and tissue effects
- Effects of moderate/high dose exposures on the embryo and fetus’ below for more complete definitions, at moderate or high doses.

- Ensuring adequate protection for both the patient and the fetus during pregnancy involves taking into account many factors related to medical exposures. Medical management of high dose exposures utilized in radiation treatment of pregnant women is under-discussed in the existing literature.
- offering information on the potential health impacts on the developing embryo or fetus from prenatal exposure to ionizing radiation, as well as practical recommendations for minimizing or preventing unneeded exposures to fetal radiation during diagnostic medical procedures that involve X-rays or radionuclides.

Materials and Methods

This research conducted a literature evaluation based on fundamental radiology studies to examine the potential dangers of radiation exposure to pregnant women and their unborn children. Three electronic databases were utilized: RSNA, PubMed, and EBSCO. Utilizing modifiers that may have contained words independent of the suffix, search phrases such as 'pregnant woman,' 'fetus,' and 'pregnancy' were employed. From 2017 until 2022, the literature review was underway. We examined full articles of similar studies and also searched books to find other related studies that weren't found in the first search.
The next step was to collect and tabulate research data after applying inclusion criteria to studies that may be relevant. In terms of methodology, the study followed the standard procedure for a literature review; the research question was defined by a review of relevant literature. There were two main phases to the study.
Initially, publications pertinent to the study's objectives were located using a database search, and those that met the criteria for inclusion were chosen. The second step was to find the optimal circumstances for reducing radiation's impact on embryos and fetuses by referencing relevant literature that examined radiation hazards throughout different stages of pregnancy. The data was used to examine radiation sensitivity and radiation resistance in relation to the fetal development stage.

Study Tool

Researchers prepared the data collection instrument for this study after scouring the most recent and pertinent literature. The author created the self-administered survey. The women of Al Madinah, Saudi Arabia, were the subjects of this cross-sectional survey.

Except for women residing outside of Al-Madinah and men, the research covered all adult females residing in Al-Madinah, whether married or not. The openepi software was used to compute the sample size at a 95% confidence interval; the result is 300. Non-Probability Sampling Method The convenience sample was utilized for sampling.

In order to accomplish the research goals, a questionnaire was used. This questionnaire had multiple-choice and yes/no items.

After participants were briefed about the research and its purpose, we made sure they understood it and that they freely agreed to participate by asking them to fill out a Google form with their approval to participate. This allowed us to document their informed consent.

- The 1st group of questions inquired about the participants' personal details, such as their age, marital status, degree of schooling, and profession (whether they worked in the health industry or not).
- The 2nd group of questions, we wanted to discover how and where the participants had learned about the dangers of radiation.
- The 3rd group of questions, we tested participants' understanding of various radiation risks during pregnancy. We asked them things like: which imaging modalities are safe to use during pregnancy, when in the pregnancy is the most vulnerable to radiation exposure (first, second, or third trimester), and so on.
- The 4th group of questions aimed at medical professionals to gauge their familiarity with the safe radiation exposure level for pregnant patients, their thoughts on whether or not it is possible to do cardiac catheterizations on pregnant patients, and whether or not an employee can continue to work in the X-ray department while pregnant.

Data Analysis

We used IBM SPSS software (version 25), developed by SPSS Inc. and available for Windows (Microsoft) in the US, to analyze the collected data. Descriptive statistics, including percentages and numbers, frequencies, and Total Unduplicated Reach and Frequency (TRUF), were among the statistical tools used.

Theoretical Framework

The biological effects of radiation exposure on a fetus

Ionizing radiation's impact on living organisms can be either predictable or unpredictable. Skin damage, cataracts, alopecia, and sterility are deterministic consequences that happen reliably when the radiation dosage goes beyond a particular point, while teratogenesis and carcinogenesis are stochastic effects that happen with a probability that grows with the dose. The radiation that people are exposed to during radiological exams is quite low and has very random effects, if any at all.

Chemical and physical reactions can cause cell death, morphological changes, DNA alterations that cause cancer, and genetic mutations; these are known as biologic consequences (Streffer, et al., 2003).

Survivors of the atomic bombs dropped on Hiroshima and Nagasaki in 1945 are the primary subjects of research documenting the effects of ionizing radiation on humans. About 2800 expectant mothers were impacted, with 500 of those receiving a dosage to the fetus above 10 mSv. Depending on the dose and duration of exposure during pregnancy, ionizing radiation can cause a variety of adverse consequences, including mortality during pregnancy, mental retardation, intrauterine growth retardation, organ malformations, and pediatric malignancies. With an additional risk of around 6% per Sv, exposures on the order of 10 mSv are believed to increase the risk of pediatric cancer. In a study published by Streffer et al. (2003), the ICRP found that the risk of childhood cancer is 2 in 600 for a fetus exposed to 30 mSv (the fetal dosage for an abdominal-pelvic CT), which is double the risk in the general population (1 in 600). Towards the end of the pregnancy, the relative danger of ionizing radiation-induced cancer declines (Gilman, et al. 1988).

Sensitivity of conceptus the same during developmental stages

Radiation can affect a growing baby in different ways at different stages of development; hence, the most relevant parameters are the total exposure duration, the dose, and the gestational age at the moment of exposure. Fetal development (beginning at 9 weeks of gestation) follows major organogenesis (which lasts from 3 to 8 weeks) and preimplantation or blastokinesis (which lasts from 0 to 2 weeks).
Radiation exposure during the pre-implantation period has two possible outcomes: it either completely eliminates the conceptus (spontaneous abortion) or it fails to implant at all. Known as the "all or nothing effect," nothing less. Irradiation up to 100 mSv (10 rem) during major organogenesis (3-8 weeks) did not raise the incidence of abnormalities. Nevertheless, dosages over 100 mSv are associated with an increased risk of deformity.

The fetal susceptibility to radiation declines during the stages of development. The central nervous system is most vulnerable to ionizing radiation from week 8 to week 25, then it is radiosensitive from week 8 to 15, less sensitive from week 16 to 25, and reasonably radioresistant after week 25. Impaired mental development, behavioral issues, and reduced IQ are all possible CNS anomalies. A 15% likelihood of microcephaly, a 6% chance of mental impairment, and a 3% possibility of pediatric malignancies, including leukemia, are associated with foetal exposures that above 150 mSv (15 rem). There is little chance of birth abnormalities and just a little increase in the risk of developing cancer later in life after the 26th week of pregnancy since the unborn baby's radiation sensitivity is comparable to that of a newborn.

The risk of pregnant health care providers

Unlike those working in direct radiation, pregnant women in the radiology department often only experience dispersed radiation. So, the fetal radiation dosage from a working mother is minimal. Dosimeters, which are badges worn by workers, measure dosages and the amount of fetal exposure below that level. Research conducted by the Royal College of Radiologist and the British Institute of Radiology found that nearly all diagnostic professionals (93%) do not get any significant doses, with just a small percentage (0.3%) receiving doses over 2 mSv per year (Brent, et al.2001). Each year, brachytherapy nurses were exposed to 4.8 mSv of radiation, whereas radiotherapy nurses got 14.1 mSv (20). According to El-Khoury et al. (2003), the National Council on Radiation Protection and Measurements (NCRP) suggests that laboratory personnel should limit the cumulative exposure to 5 mSv (0.5 rem) throughout the whole gestation period, protecting the fetuses of these professionals.
The rate of dose accumulation is also limited to 0.5 mSv (50 mrem) each month once a pregnancy is known. Do not mistake this occupational exposure recommendation with the teratogenic threshold dosage; the former is one hundredth of the latter. Workers who are exposed to radiation should notify their employers as soon as possible if they are pregnant so that they can adjust their work schedules to minimize their exposure, even if the majority of workers receive very low doses (El-Khoury, et al. 2003).

The critical dose for the fetus and what should be the policy for therapeutic abortion

Women should be informed that X-ray exposure during a single diagnostic procedure does not cause detrimental consequences to the developing fetus, according to a policy statement released by the American College of Obstetricians and Gynecologists. In particular, there is no correlation between exposure to radiation levels below 50 mSv (5 rem) and an increased risk of fetal abnormalities or miscarriage.

According to these claims, the risk is not significant at doses below 50 mSv; it is similar to the risk of spontaneous abortion (15%), major malformations 3%, intrauterine growth retardation 4%, and mental retardation 1% in unexposed fetuses (McCollough, et al.2007; Streffer, et al.2003, Brent, & Mettler, 2004). The cumulative rise above the background incidence for organ malformation and the development of pediatric cancer is only around 1% when the dosage is doubled, to 100 mSv, compared to doses of 50 mSv.

The effect of iodinated contrast agents during pregnancy

Iodinated contrast agents provide a potential danger to fetal or neonatal thyroid function when used during pregnancy and breastfeeding because of the free iodide they contain. Consequently, it is recommended that pregnant women and nursing mothers avoid using iodinated contrast media. Additionally, it is important to wait 12 hours after injecting contrast media to discard breast milk. it is recommended to examine the newborn's thyroid function during the first week after birth if the mother was given iodinated contrast media following a risk-benefit analysis (Karabulut, & Ariyürek, 2006).

Effects of moderate/high dose exposures on the embryo and fetus

Types of effects

For the sake of radiation protection, the biological effects of ionizing radiation are categorized as either "stochastic" or "tissue reactions," the former of which is the more traditional name. Tissue responses are dose-dependent and have a clear cutoff point below which they become less noticeable. There is no cutoff for stochastic effects; rather, the likelihood of an impact grows with dosage, but the effect's intensity is independent of dosage. Mutations create stochastic effects (cancers and hereditary effects), whereas cell death or functional inactivation mostly causes tissue impacts. (Temperton, 2009).

Non-cancer effects

Similar to effects seen in rats as early as 1922, these abnormalities occurred at high doses but were not documented. They seemed to be central nervous system (CNS) and ocular problems. The threshold for radiation-induced overall small fetal size and congenital abnormalities in the early human fetus is unknown, according to Rugh (Rugh, 1971). On average, Japanese prenatal cohort adolescents had greater systolic blood pressure and shorter statures (Ozasa, 2019). This could be true, however there is a lack of evidence, for the two most prevalent teratogenic outcomes, intellectual impairment (previously known as mental retardation) and microcephaly (small head size) (Hughes,1985).

Epidemiology

131I, the most common radioactive fallout from Chernobyl, is absorbed by the developing fetus and mostly concentrates in the thyroid. Babies exposed to this condition exhibited microcephaly, a lower head size, and normal birth weights, according to research by (Hatch et al. 2017). Like the Japanese in utero cohort, the results were associated in a dose-dependent manner. Nonetheless, it was discovered that the gestational durations of the group exposed to 131I increased with each Gy, with a dose-dependent effect of 0.5 weeks (American College of Radiology, 2005).

Neuropathology and foetal death

On the other hand, contemporary testing was not conducted on the Japanese LSS cohort. Since there were only 25 informative instances with serious mental disorders out of 2000 kids delivered in the two towns to mothers who were pregnant when the bombs were dropped, the uncertainties are substantial. This is because the research group was very small. While the formation of neurons and synapses occurs between 8 and 15 weeks after conception, only those exposed to doses greater than 1 Gy showed effects for predicted absorbed doses in the range of 0-2 Gy (Otake & Schull 1984).

Therapeutic abortion using x-rays

When surgery was not an option, women in the 1930s were sterilised using external beam radiation, which is not current nor common treatment today. A treatment of 3-5 Gy dosage administered over 2 days led to fetal demise around one month later, as mentioned by Bushberg et al. (2011). Interestingly, there are accounts of additional occasions when cancer patients who were pregnant received radiation doses as high as 8.5 Gy without experiencing foetal death. In these situations, the kid remained healthy both at delivery and for a while afterward (Bowerman et al 1968).

Teratogenesis

The timing of radiation exposure is closely related to the effects it has on the developing baby. Before conception, there is a period called major organogenesis, which lasts from 2 to 7 weeks after conception. Between 8 and 15 weeks, also called late or minor organogenesis, there is a peak risk of neuropathology and malformations. From 16 to 27 weeks, there is a continued risk of growth retardation but lower risks of neuropathology and malformations. After 27 weeks, the risk of growth retardation increases until birth, which typically occurs at around 40 weeks (Berlin, L., & Berlin, 1995).

Late organogenesis (8–15 weeks' post-conception)

With a 100 mGy threshold dosage for possible abnormalities and growth retardation, this is the most radiosensitive stage in the entire gestation. The rapid migratory and mitosis rate of neurons are to blame for this. Brain heterotopia, neuronal depletion, and disordered synapses were observed in certain children from the Japanese in utero cohort exposed during this extremely vulnerable stage. Seizures, behavioral impairments, and worse academic performance were also reported. The prevalence of intellectual impairment increased linearly with dosage at 40% Gy−1, and a 25-point decline in IQ was linked to a 1 Gy dose. Microcephaly, defined as a small head size, is one of the conditions mentioned in ICRP (2003) and UNSCEAR (1977). The threshold for microcephaly is an open subject, and one may infer that it may be possible to detect slight changes in intelligence due to radiation.

RESEARCH METHODOLOGY

Method

The descriptive statistical method was used to achieve the main purposes of the study and to answer the research questions.

Sample

The sample of this study was the population of the study using the descriptive method. It included some of pregnant females in Makkah, SA.
After being sent out, the survey was gathered. Using SPSS, we examined every survey's data.
Independent factors of experience and qualifications were used to disperse the sample.

A- Qualification variable

Table (1): Sample distribution according to the qualification variable

Qualification Variable	***N***	***%***
18- 29 year	8	10.5
30- 39 year	64	84.2
40- 49 year	4	5.3
50- 59 year	12	26.3
60 +	none	none

C: Experience variable

Table (2): Sample distribution according to the years of experience of learning English language variable

Experience Education	***N***	***%***
Elementary school	14	18.4
Intermediate school	19	25
Secondary school	18	23.7
university	25	32.9

Instrumentation

The researcher distributed a questionnaire of forty items to all the subjects of this study.

The researcher modified the questionnaire according to Likert's five-level items:

a. Very high degree

b. High degree

c. Moderate

d. Low degree

e. Very low degree

This questionnaire had four domains with the following items:

f. A cover page containing the researcher's letter to the students.

g. Domain one containing items about. 18-29 years.

h. Domain two containing items about 30 -39 years.

i. Domain three containing items about 40 – 49 years

j. Domain four that contained items about 50 – 59 years

The researcher adopted and modified the items of the questionnaire from different resources: Marshall and Rowland (1998); Petty (2000) and Springs (1999).

Validity of the questionnaire

The questionnaire was presented to a panel of five expert physicians in the area to verify its validity. The professionals were requested to assess if the questionnaire was suitable for the entire investigation. Overall, they were on board with the questionnaire's parameters, however they did have some suggestions for wording changes. The researcher drew on the appropriate literature to construct the questionnaire.

Reliability

If the estimated mark for a person on the exam's measuring qualities is close to the real mark, then the estimate is reliable. The dependability of three sub-questionnaires was determined using the Alpha formula.

Table 3: Alpha formula of instrument reliability.

Age Average	***Reliability***
18-29 years.	0.77
30 -39 years.	0.78
40 – 49 years	0.82
50 – 59 years	0.72
Total score	0.77

The results of Table 3 show that the ranges of reliability were between 0.72 – 0.82 and the total score was 0.77. All of these values were suitable for conducting such a study.

Procedures

To achieve the aim of this study, the researcher used the following procedures during the application of this study:

1. After establishing the validity and reliability of the questionnaire by the experts in medicine. The researcher incorporated the changes which were suggested by the experts.
2. The researcher specified the population of the study, as it appears on Table (1).
3. Using the descriptive statistical method, the researcher selected all the target population as a sample of the study.
4. The researcher herself administered the instrument to teachers. In order to obtain more valid and credible results, the teachers were given the freedom to complete the questionnaire immediately or at their earliest convenience. In addition, the completion was voluntary.
5. The researcher managed to collect almost all the copies. Then, the questionnaire data were statistically processed.

Study Design

The researcher used the descriptive statistical method to study the relationship between the variables. After collecting the data, she used the analytical statistical method to test the hypotheses to explain and interpret the results.

Variables of the study

1. **Independent variables:**

- Age (less than 20 years, 20-30years, more than 40-50 years)
- Qualification (primary schools / prep schools / secondary schools/ university)

2.Dependent variables:

- The effect of Diagnostic X-rays on the Fetus (between 8–15 weeks) During pregnancy among females in Makkah, KSA

Data Analysis

In order to analyze the data, the researcher used statistical techniques the Statistical Packages for Social Science (SPSS), descriptive statistics, means, standard deviations and percentages.

- For data analysis, the researcher used the following percentages: 80 % and more is very high degree of self-learning effect.
- 70-79.9% is high degree of 18-29 years.
- 60 - 69.9 % is moderate degree of 30-39 years.
- 50 - 59.9 % is low degree of 40-49 years.
- Less than 50 % is very low degree of 50-59 years.

Results Discussion

Some of the most prevalent biological impacts of radiation are cancer, decreased longevity, and genetic damage. Cancers of the blood, skin, thyroid, breast, osteosarcoma, and lungs are all examples of radiation-induced malignancies. The opposite is true for deterministic effects, which are thought of as non-stochastic dangers because of their lack of randomness. Regular diagnostic imaging exams and occupational exposure do not have deterministic consequences, but major radiation accidents do.

Negative health consequences on humans can occur with prolonged exposure to high radiation levels. The embryo or baby will also absorb some of the radiation that a pregnant woman is exposed to. Stochastic effects, which occur when the human body is exposed to low doses of radiation over an extended length of time, provide long-term dangers in the form of biological repercussions. Location, local tissue and organ features, dosage, exposure duration, and associated illness all play a role in radiation's effects. In humans, every 10 mSv is associated with a roughly 10-day reduction in lifetime.

Knowing the level of radiation danger at each stage of pregnancy is crucial for all parties involved in minimizing radiation's detrimental effects on the fetus. The greatest risk of fetal malformations from radiation exposure occurs between the ages of 8 and 15 weeks of gestation. The deterministic effect of foetal death has already been mentioned.
throughout the preimplantation stage, embryos are reasonably resistant to radiation. However, throughout the organ-forming stage (weeks 2-8) and the neural stem cell proliferation stage (weeks 8-15), they become extremely vulnerable

to radiation. The embryo reaches its most radiosensitive phase—the fast-developing cell system—during the organogenesis and neural stem cell proliferation stages. There is no evidence from medical studies to suggest an elevated risk of side effects from greater radiation doses after 25 weeks.

The severity of side effects such embryonic mortality, deformity, growth restriction, and miscarriage varies substantially with the radiation dose and the stage of fetal development. The following figure shows the effects of low-level radiation exposure on the developing foetus, as studied in both animals and humans. The data shown here indicate the stages of development when the foetus is most vulnerable to radiation and when it is most resistant.

Conclusion:

Focusing on pregnant women in Makkah, Saudi Arabia, this study highlights the major repercussions of diagnostic X-ray exposure on the fetus, especially during the key gestational period of 8–15 weeks. Radiation exposure during this time is known to raise the likelihood of developmental defects and childhood malignancies, among other poor prenatal outcomes. Our data support this notion. Radiation dosage, gestational age, and foetal risk are all intricately related, as our literature study shows. While many diagnostic imaging treatments include modest amounts of radiation that often do not cause any harm, it is important to think about the long-term consequences of exposure to larger levels or recurrent exposure. Thorough precautions are required to reduce exposure and safeguard the health of both the mother and the fetus since the fetus is most sensitive to radiation during organogenesis. When it comes to handling diagnostic imaging while pregnant, ethical issues are paramount. Medical professionals face a delicate balancing act between the diagnostic advantages of imaging and the hazards of radiation exposure. For imaging operations to be justified and exposure to be reduced, there must be improved communication and strict adherence to protocols. Despite the known hazards, diagnostic imaging is becoming more common during pregnancy. This highlights the need for healthcare practitioners and people to work together to raise awareness and educate each other.

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