Environmental Effects on Prenatal Development

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Prenatal development refers to the process that occurs to a child within the mother's womb and before the time of delivery. Scientists state that this process often takes a period equal to 40 weeks. The forty weeks are comprised of multiple stages. The three primary stages of prenatal development in humans include the germinal stage, embryonic stage, and fetal stage. Research shows that various environmental factors influence prenatal development processes depending on the specific stages of the development. However, the development status of a fetus is always subject to the living styles and behavioral characteristics adopted by the parent. Therefore, the baby’s prenatal development is affected by the environmental conditions where the mother is exposed during the 40 weeks of conception (Kamai et al., 2019). This paper discusses the various ways in which environmental factors can influence the processes associated with prenatal development.

**Background**

Birth weight is one of the most commonly studied topics regarding the health outcomes associated with environmental epidemiology. Birth weight is usually taken at the time of birth and is subject to low and lesser possibilities of error occurrence than the other measurements taken about pregnancy outcomes. Studies show that birth weight should always remain within a given range under normal conditions. When the weight scores range too high or too low, the newborn babies face significant health risks regarding their development in the subsequent stages of life (Dwyer, 2017). As a result, mothers should take care of the development processes occurring within their wombs.

Health care practitioners can also examine the effectiveness of fetal growth without the use of birth weight. One of the alternative procedures is the use of ultrasound parameters. This technique measures the fetal size’s parameters at different points of time throughout the conception period. The scores in those parameters are also evaluated in conjunction with the scores attained at the point of birth. Using those measurements at different stages helps the health care practitioners minimize the chances of error when examining the birth weight at the point of birth. Additionally, this process helps the practitioners to identify abnormalities in fetal development at the earliest possible instances.

Also, this technique is essential in the management of windows associated with the gestation period. During these windows, the process of fetal growth and development is more sensitive to effects accruing from environmental conditions. The application of ultrasound parameters helps healthcare practitioners identify the environmental conditions that significantly influence fetal growth and development at specific periods ("Fetal development: Environmental influences and critical periods," 2019). When such realizations are reached at early stages, it is easier for the health care providers to find a solution to the relative challenges. They can also advise the victims about the environmental factors that they should avoid and the ones that they should embrace for the healthy development of their fetuses.

The discussions made in the paragraphs above show that ensuring a healthy development of the fetus throughout the gestation period is a critical process that calls for attention from both the expectant individuals and the health care practitioners. Studies also claim a significant linkage between the trends of fetal growth and the environmental conditions associated with their mothers’ exposures. Research shows that some of the environmental conditions that cause negative health effects to the growth and development of the fetus at the prenatal stages are persistent organic pollutants and air pollution. Exposing pregnant women to such conditions makes them more vulnerable to pregnancy challenges like fetal development and miscarriage abnormalities. Hence, the current project aims at evaluating the basis of the relationships between the two factors – fetal development and environmental exposures.

The null hypothesis regarding this study assumes that environmental exposures cause significant effects on fetal growth and development trends during the prenatal period. Hence, the evaluations, analysis, and other procedures associated with the current study aim at examining the presence or absence of the relationship between the two variables highlighted in the study hypothesis.

**Literature review**

This section outlines findings from some past studies about the relationships between the trends of fetal growth and the environmental exposures or conditions associated with their mothers’ exposures during the gestation periods. It also highlights some of the primary subjects related to the topic of ecological factors' effects on the prenatal development processes. The main subjects addressed by studies under this section include teratogen, alcohol, illegal drugs, smoking, radiation, pollution, and infectious diseases.

Most of the scientific studies completed so far show that its eco-sensitive nature mainly characterizes human growth and development as it is sensitive to a wide variety of features of the environment (Källén, 2016). The public health sectors in developed and developing countries are more concerned with pregnancy complications and adverse birth outcomes. Environmental factors like the teratogens-exposure can have an adverse effect on the fetus' development processes.

**Radiation**

Radiation is also a significant inhibitor to healthy fetal development. Research shows that it is highly risky to expose pregnant women to mining sites with harmful radiation (Nieuwenhuijsen et al., 2013). Mining processes used for cases like titanium mining are known to have had serious health consequences to humans. They produce harmful radiations that harm humans and exposes them to risks like carcinogenic illnesses. Similar effects are experienced through the use of X-rays and the cancer treatment processes. Although the effects obtained from such unfriendly environmental conditions are risky to all society members, the effects are more significant regarding pregnant women because of the relative effects on the prenatal development process. Also, an expectant mother who breathes in or swallows radioactive materials may absorb the substances in her system. Radioactive materials from the mother's bloodstream pass to the fetus and lead to defects in its normal development processes.

**Pollution**

The effects of air pollution often begin prenatally. Air pollutants may affect a pregnant person and the development of the fetus. The contaminants breathed in by the mother pass through the placenta to the baby (Workalemahu et al., 2018). Air pollution includes; household chemicals such as asbestos, allergens such as mold, pollution from fire and smoke, air pollution from smog, and occupational hazards such as working with a toxic chemical. Most studies report that weight and height growth are more favorable in less polluted areas.

**Exposure to chemicals**

Birth weight is one of the most commonly studied topics regarding the health outcomes associated with environmental epidemiology. However, research shows that birth weight and trends regarding fetal development are negatively affected by environmental factors related to such chemicals as biomarkers, non-persistent pesticides, and phthalates. Birth weight is usually taken at the time of birth and is subject to low and lesser possibilities of error occurrence than the other measurements taken about pregnancy outcomes. Studies show that birth weight should always remain within a given range under normal conditions (Wu, 2018). When the weight scores range too high or too low, the newborn babies face significant health risks regarding their development in the subsequent stages of life.

**Alcohol**

Ingestion of alcoholic drinks a pregnant woman passes to the fetus following the umbilical cord and through the placenta. Research shows that excessive drinking during the gestation period is dangerous because it may affect the fetus negatively by causing a spectrum of conditions called fetal alcohol spectrum disorders (FASD). These conditions often lead to prolonged consequences to the unborn babies – some of which may last forever and in some other cases be the cause of their death at young ages. Some of the primary characteristics of children suffering from fetal alcohol spectrum disorders are low birth weight, abnormal physical features, and small head size. In addition, they may have lower IQ scores, unreliable impulse control, low judgment, and high learning challenges (Y et al., 2019). Studies show that development delays are some of the challenges that persist into adulthood.

**Prescription drugs**

Prescription and other types of drugs other than alcohol can also lead to challenges in prenatal development. Babies exposed to such drugs during their prenatal stages can be addicted and are likely to suffer similar effects to the ones exposed to alcohol as outlined above. Hence, they also become vulnerable to low birth weight, abnormal physical features, small head size, lower IQ scores, unreliable impulse control, low judgment, and high learning challenges. Studies have shown that high aspirin doses among pregnant mothers can lead to severe effects like fetal bleeding. These findings show that pregnant women should be careful about the medication trends they keep during their forty weeks of pregnancy.

**Smoke and smoking**

Smoking is harmful to the mother, the fetus, and the other society members around the smoker. It is one of the significant causes of environmental pollution. Studies show that a mother smoking tobacco risks the fetus's life because the resultant substance subjects the fetal environments to a decrease in blood-oxygen levels. Research also shows that pregnant women with significant smoking habits are more vulnerable to giving birth to underweight, premature birth, stillbirth, and Sudden Infant Death Syndrome (SIDS). Such health challenges at birth confirm the child had been facing difficulties in development processes throughout the prenatal period.

**Infectious disease**

Diseases are also part of environmental factors that affect prenatal development among pregnant women. Although some infectious diseases impact maternal health, others may affect the fetus with long-term effects. Research shows that pregnant women are usually vulnerable to specific health challenges that may influence the stability of their immune systems. In the long run, such infections may also reduce their abilities to support the fetus's development within their wombs. Research shows that some of such infections accrue from the changes in physiology during pregnancy, including increased bladder volume, decreased bladder, and ureteral dilatation, which may cause infections in the urinary tract. Asymptomatic bacteriuria is associated with low birth weight infants, preterm delivery, and IUGR (Zheng et al., 2016). Acute pyelonephritis leads to renal dysfunction, the premature rupture of membrane, anemia, preeclampsia, preterm labor, and septic shock during pregnancy.

**Methodology**

This section highlights the methods and procedures applied in the current research to study the characteristics associated with the relationships of the two elements – environmental exposures and fetal development. The study assumes that environmental exposures cause significant effects on fetal growth and development trends during the prenatal period. Therefore, the methodology adopted for this study will focus on answering the two study questions listed below.

Research questions

1. Are environmental exposures and fetal development significantly related when other factors like food availability and security are held constant?
2. Do women in pollution-free environments or clean environmental conditions have more chances of experiencing normal gestation periods than women in polluted and unhealthy environmental conditions?

Procedures

This research is mainly based on reviewing past scientific studies and evaluating their specific arguments about the linkage between environmental exposures and fetal development. It relies on a meta-analysis of the articles obtained from different online databases. Some of the academic databases applied for this process were PubMed and Google Scholar. The keywords making up the topic of the current research were searched in the online databases to identify the articles and other sources addressing environmental exposures and their effect on prenatal development.

The search came up with more than 1200 thousand results. However, the results were filtered through the review of their topics as well as their abstracts. This procedure reduced the number of resources to 120. Additionally, the project used a criterion known as a critical appraisal of research to evaluate the reliability of the 120 articles regarding the current research project. During this process, the articles were depending on their relative evidence levels. Articles with evidence levels I, II, and III were considered, while those with different scores regarding their evidence levels were excluded from the research. Five articles were left for application in the current project. The results attained from the five articles are outlined and discussed below.

**Results and discussion**

80% of the articles used in this research show that birth weight and trends regarding fetal development are negatively affected by environmental factors associated with such chemicals as biomarkers, non-persistent pesticides, and phthalates. Additionally, all of the five articles used in this research showed that pregnant women often face more significant risks when exposed to areas with high levels of air pollutions. Also, the findings from the reviewed literature show that the rate of applying the ultrasound parameters to assess the trends of fetal development during the gestation period is significantly low.

According to the reviewed literature findings, there is a significant linkage between environmental exposures and fetal development. This claim is supported by the results of past studies regarding the effects of air pollution, biomarkers, non-persistent pesticides, and phthalates. These studies show that pregnant women are more sensitive to unfriendly environmental conditions than other members of society. They have certain hormonal characteristics that give them more significant responses to factors like air pollution and exposure to chemicals. When exposed to such conditions, the mothers pass the resultant effects to their fetus through the placenta. Hence, they end up experiencing poor fetal development the relative health conditions.

The literature review also shows that it is perilous to expose pregnant women to mining sites with harmful radiation. Mining processes used for cases like titanium mining are known to have had severe health consequences to humans. They produce harmful radiations that harm humans and exposes them to risks like carcinogenic illnesses. Similar effects are experienced through the use of X-rays and the cancer treatment processes. Although the effects obtained from such unfriendly environmental conditions are risky to all society members, the effects are more significant regarding pregnant women because of the relative effects on the prenatal development process.

Therefore, pregnant women and health care practitioners should take care of the fetal development processes during the gestation periods by focusing on the safety of their environments and using the ultrasound parameters. The application of ultrasound parameters helps healthcare practitioners identify the environmental conditions that significantly influence fetal growth and development at specific periods. When such realizations are reached at early stages, it is easier for the health care providers to find a solution to the relative challenges. They can also advise the victims about the environmental factors that they should avoid and the ones that they should embrace for the healthy development of their fetuses.

**Conclusion**

In conclusion, the analysis done above shows that environmental-exposures have significant effects on fetal growth and development trends during the prenatal period. Some of the environmental conditions that cause negative health effects to the growth and development of fetuses at the prenatal stages are persistent organic pollutants and air pollution. Exposing pregnant women to such conditions makes them more vulnerable to pregnancy challenges like fetal development and miscarriage abnormalities. Also, birth weight and trends regarding fetal development are negatively affected by environmental factors associated with such chemicals as biomarkers, non-persistent pesticides, and phthalates.

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