African Journal of Human Development and Lifespan (AJHDL)
4, 1-21

https://ajhdl.org
ISSN

Knowledge and Practices that Prevent the Impact of Teratogenic Factors on Fetuses among Pregnant Women

Paschal Chukwuma Ugwu

Department of Psychology, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria

https://orcid.org/0000-0002-1597-4807

pc.ugwu@unizik.edu.ng

Abstract

The present study explored the knowledge and practice that could prevent the impact of teratogens among twenty four (24) pregnant women selected from Awka metropolis and four rural communities in Anambra State, Nigeria. Their ages ranged from 21 to 38 years, with a mean age of 29.4 and a standard deviation of 4.1. Six key interview questions guided the study. The phenomenological research design was adopted and content analysis was utilized for the study. The results showed that the study participants have some knowledge of teratogens. There were differences in knowledge between rural and urban participants, high and low education status but not in income status. There were no differences in locality and income status in understanding how teratogens affect fetus and pregnant women but there was a difference between the highly educated and lowly educated. It was found that there were differences in level of carefulness observed during pregnancy with regard to locality, education and inome status. Also, responses to the interview questions of preventive measures and who should be involved in the campaign against teratogens showed no differences in education qualifications, locality and income status in respondents' recommendations. From the findings, the researcher recommended among others that awareness of teratogens and their consequences should be incorporated into secondary education curriculum in order to prepare the citizens for a better society.

Keywords: Teratogens, prenatal, human development, fetuses, awareness

Introduction

Infant mortality and other related cases constitute challenges that deprive parents' the joy of parenthood. Globally, child mortality rate is quite high in African and Asian regions (World Health Organization, WHO, 2024). It is a public health concern given the short- and long-term consequences of child death (United Nations Children Education Funds, UNICEF, 2024; World Health Organization, WHO, 2024). In 2021, the number of stillbirths recorded was 1.9 million, and neonatal deaths in 2022 were 6,300 daily (WHO, 2024). Unfortunately, some factors that cause stillbirth and infant mortality may lead to maternal mortality. WHO (2023) reported the number of maternal deaths in 2020 to be about 287,000 in low- and middle-income countries. The humongous numbers of stillbirths and infant and maternal mortality are fearful and deserve drastic measures that could eradicate them. Ultimately, stillbirth and infant mortality may have short- and long-term psychological implications for the parents' wellbeing.

Basically, childbirth is a great milestone in the lives of parents (Szefler, 2014). In Nigeria, specifically among the Igbo race, celebrations are held to commemorate the birth of a baby (Francis-Edoziuno, LaPlant, & Lucas, 2024). The duration of such events may be determined by the health status of the newborn or mother, the socio-economic status of the parents, and prevailing environmental conditions. The healthiness or otherwise of the newborn determines the level of happiness or sadness the parents may experience (Brajša-Žganec, 2023; Dyrdal & Lucas, 2013). Also, the general health status of the newborn plays a critical role in subsequent adjustment, functioning, and overall development in the environment. It is worthy to note that developmental delays may affect not only the children but also their parents, siblings, and significant others in their lives. Hence, it was reported that children with atypical development and developmental delays pose an extra burden

of care on the parents, caregivers, siblings, and teachers, among others (Nwafor et al., 2022).

However, atypical cognitive and physical development and developmental delays may arise from prenatal events. Arguably, some women experience eventful pregnancies, which intricately may impact fetal growth, overall functioning after birth, and the woman's wellbeing (Adewuyi, 2019; Alonge & Aluko, 2022). Characteristically, eventful gestation period refers to pregnancies in which a woman encountered some unwholesome events that were not good for the pregnancy or the woman (Chakrabarti, 2016). Nevertheless, it is worthy of note that not all the eventful pregnancy experiences impact fetal growth and development negatively. However, every woman planning to conceive hopes for an uneventful pregnancy.

Globally, eventful pregnancies are common in low- and middle-income countries (Mishra, 2023; Obiekwu et al., 2020). Additionally, eventful pregnancies are more common in rural and semi-rural areas. For instance, Nigeria, as one of the low-income countries, recorded a thirteen percent (13%) uneventful gestation period in recent times, and the incidences were in rural areas (Obiekwu et al., 2020). The rural areas are characterized by low population density, lacking in critical infrastructure such as hospitals, schools, good access roads, steady electricity power supply, low job opportunities, an unorganized transport system, and poor market, among other inadequacies (Dasgupta et al., 2014). The reason behind the high prevalence of pregnancies in rural and semi-rural areas may not be far-fetched given the lack of availability of basic infrastructure that play a critical role in quality of life and healthy living. For example, hospitals, the availability of health experts, access to correct health information, a good transport system, and schools, among others, seem to be essential in ensuring fetal health and safe delivery.

Similarly, the knowledge of teratogens by pregnant women is an important factor in the manifestation of eventful pregnancies and their related consequences. It entails the level of health awareness about what constitutes dangers to the fetal development and health of the woman. Teratogens refer to events that can potentiate and compromise stable fetal development and subsequent functioning after birth (Chaudhary & Sehgal, 2019). Furthermore, engagement in behaviors that could curtail exposure to teratogenic factors is equally important. Having the knowledge and practicing what can promote the optimum functioning of the fetus is critical (Sharma, 2021). One may argue that knowledge of teratogens and their short- and long-term consequences could not guarantee engagement in safe behaviors. Thus, the attitude of the pregnant women and cultural idiosyncrasy may play roles in the tendency to seek knowledge of threats to prenatal development and how to prevent them.

In the same vein, the tendency to obtain knowledge and engage in behaviors that promote a healthy lifestyle is theoretically explained by the health behavior model (Hochbaum & Rosentock, 1952). The model originally postulated four conditions that could propel or hinder health-related behavior. The conditions are as follows: 1. perceived susceptibility (the knowledge of tertogens and the vulnerability of a pregnant woman could influence health behavior); 2. perceived severity (the knowledge of the impact of teratogenic effects on fetal development and functioning after delivery is a critical factor that could lead to the practice of healthy behavior); 3. perceived benefits (the tendency to check whether the consequences outweigh the benefits of engaging in health-related behaviors and viza viza); and 4. Perceived barriers (refers to factors that could prevent the practice of a healthy lifestyle among pregnant women). The model was later expanded to six dimensions, and the extra two are as follows: 5. Cue to action (implies factors that could stimulate seeking information about fetus safety or engaging in health-related behaviors to protect the fetus and other safe gestation practices) and 6. Self-efficacy (refers to the self-

assessment of the pregnant woman that could enable her to practice a safe lifestyle that would benefit the fetus and herself). The model succinctly captured the essence of this study.

Hypotheses

The present study explored the knowledge, consequences of teratogens, and practices that could protect pregnancy and ensure the delivery of healthy and well-functioning infants. Teratogens are conceptualized as events or behaviors that are capable of affecting the pregnancy and threatening stable functioning after delivery. To deepen the understanding of the teratogens, the following research questions guided the study.

1. To what extent do rural and urban pregnant women understand factors that constitute teratogens?
2. To what extent do rural and urban pregnant women understand the impact of teratogens?
3. To what extent do rural and urban pregnant women understand the behaviors that could prevent teratogens?
4. Does income status affect the understanding of teratogens between rural and urban pregnant women?
5. Does educational level affect the understanding of teratogens between rural and urban pregnant women?

Method

Participants

A total of twenty-four (24) pregnant women were selected from maternity centers, where they attend regular prenatal check-ups. Their ages ranged from 21 to 38 years, with a mean age of 29.4 and a standard deviation of 4.1. The participants were purposefully selected from a tertiary health facility in Awka metropolis and four primary health care centers in four rural communities in Anambra State. The four communities were mainly inhabited by peasant farmers, petty traders, and others. They are characterized by low population density and the unavailability of basic infrastructure. The listed characteristics were used to classify the communities as rural areas, which is in tandem with the World Bank's (Dijkstra et al., 2020) classification of rural and urban areas. Specifically, 12 women were selected from the teaching hospital, and 3 women each were selected from the 4 primary health care centers in the rural communities. The educational levels of the participants are as follows: 1 held a PhD, 2 held MSc, 4 held BSc, 5 held NCE, 4 held diplomas, 7 held SSCE, and 1 held a FSLC. In this study, PhD, MSc, and BSc were classified as high education status whereas NCE, Diplomas, SSCE, and FSLC were classified as low education status. Also, their socio-economic status of the participants ranged as follows: 8 were senior civil servants, had cars, and earned more than one hundred and fifty thousand naira monthly (#150, 000) classified in this study as high income status. 10 participants were farmers, petty traders, and government and private workers who earn below fifty thousand naira monthly classified as low income status. Five participants were housewives, mostly students who depend on their partners for finance.

Instruments

A structured interview was utilized in the study. The interview guide was developed from the research questions. The six interview questions covered knowledge of teratogens, the consequences of teratogens, and preventive behaviors. The following were the questions:

1. Do you know conditions that can affect pregnant women and their fetuses negatively?
2. What are the conditions?
3. How do they affect mothers and their fetuses?
4. Do you think people care about this?
5. What do you think should be done to prevent the consequences?
6. Who should be involved in the campaign to prevent these conditions?

To ensure the robustness of the study, the title, research questions, and interview guides were sent to four experts in the fields of developmental psychology, anthropology, nursing, and measurement and evaluation at Nnamdi Azikiwe University, Awka. They were requested to check the adequacy of the interview questions in eliciting comprehensive responses in line with the title and research questions. The inter-rater reliability was significantly high. All the experts agreed that the questions covered the key areas of the study, namely: knowledge of teratogens, consequences of teratogens, and practices that could prevent their occurrence. It is imperative to note that the reason for subjecting the interview guide to a multi-expert review was to avoid bias.

Procedure/Ethical Consideration

The ethical approval for the study was granted by the Nnamdi Azikiwe University humanities and social sciences ethical committee. The ethical rule required that all

the information supplied by the participants be treated with the utmost confidentiality and used only for research purposes, and that the researcher undertake to abide by these rules. The participants were selected from maternities who were attending antenatal check-ups. Half of the participants were selected from a teaching hospital located in the Anambra State capital, an urban area, whereas the rest were selected from primary health centers in four rural communities. The management of the hospitals was informed about the study, and they gave approval for participants to be selected from their centers. The participants were informed of the purpose of the study and their freedom to withdraw from the interview at any time. Those who agreed to participate were administered consent forms. The average time for an interview section was 11 minutes. Two research assistants helped with the interviews.

Design

A phenomenological research design was adopted for the study. This design enables phenomena to be described according to the way people experience them. It enabled the researchers to obtain information about their understanding of teratogens. Similarly, content analyses of the responses were conducted.

Results

Generally, all the participants have knowledge of the factors that negatively affect pregnancies and fetuses. They answered affirmatively without hesitation, which showed that they knew that some conditions could terribly affect the pregnancy, the fetus, and the woman's life. The unanimous responses to the first interview question showed appreciable knowledge of the phenomenon.

Secondly, the content analysis of the interview showed that the respondents mentioned numerous teratogens. The factors mentioned include hazardous

pollution, excessive substance abuse such as alcohol, non-prescribed use of over-the-counter drugs, stress and intimate partner violence, rubella virus, malnutrition, infectious diseases, incompatible Rhesus factor, blood group, untreated infection disease, domestic violence, non-attendance of prenatal health check-ups, lack of information about pregnancy, an aged mother, rays, war, an earth quake, loud noise such as a bomb explosion, and witchcraft. The information obtained from the participants was in-depth and quite informative. Interestingly, results showed that participants from urban areas mentioned more factors than those from rural communities. Additionally, participants from the urban areas described some factors, such as a lack of essential information by pregnant women, rays, and untreated infections, which participants from the rural areas talked about. However, some participants from the rural communities mentioned witchcraft as something that is not often talked about but matters seriously. Below is what one of them said about how witchcraft represents a teratogen.

"*Even in the maternity centers, nurses would always ignore the talk about how powerful witchcraft can affect pregnancy, but they are wrong. It is as serious as any other factor, such as an untreated infectious disease. It can cause deformation, stillbirth, miscarriage, and the death of the woman.*"

On the other hand, some participants from the urban center uniquely described a lack of necessary information about safe pregnancy, rays, and untreated infections as the most potent teratogens. One of them said as follows:

"*There are many conditions that are capable of threatening the growth of a pregnancy but are mostly ignored because of a lack of information by some accidental pregnant women. Some people had infections even before conception but didn't treat them, which would negatively affect the pregnancy and the mother. "A pregnant woman undergoing x-rays exposes the baby to danger.*"

Furthermore, the result showed that pregnant women with BSc, MSc, and PhD have a better understanding of factors that constitute teratogens than those with NCE, Diploma, SSCE, and FSLC. This finding underscores the importance of advanced education in the self-exploration of necessary information. For instance, the rhesus factor as a teratogen was not mentioned by all the participants without a BSc or above, which demonstrates that knowledge acquired in a higher education setting is relevant to prenatal development. However, there was no difference in the knowledge of teratogens between high and low income status among the pregnant women.

The responses to the third interview question: How do teratogens affect mothers and fetuses? The result showed that the majority of the respondents reported teratogenic effects, namely, miscarriage, inability to conceive due to previous exposure to a teratogenic exposure, stillbirth, death of the newborn after delivery, delivery of a deformed baby, autistic child, other developmental delays, sickly child, and death of mother. A minor number of the participants from the urban area reported some effects of teratogens, such as inability to conceive due to previous exposure to a teratogen, autism, Down syndrome, cerebral palsy, and developmental delays. The majority of the participants, which are a mixture of participants from both urban and rural areas, noted that teratogen can lead to stillbirth, death after delivery, constant sickness of the baby after delivery, and the death of a mother. One of the participants noted that teratogens can cause stillbirth, death during or after delivery, and death of the mother, which results from witchcraft. Though, she acknowledged that other teratogens can affect the functioning of fetus and the mother. She strongly asserted that they cannot lead to stillbirth or death during or after delivery of the child.

Additionally, participants with higher degrees enumerated more consequences of teratogens than their counterparts with lower educational qualifications. One of the participants with a PhD noted the following:

"*A lot of challenges facing human development may have originated in the womb; for instance, some children are not performing well academically because of what their mothers did when they were pregnant. Some are deformed and not happy with it; some die in the womb, and there are many other consequences.*"

Similarly, one of the lowly educated participants averred as follows:

"From what I learned at the antenatal checkup, some bad things could result from what pregnant women do. For example, a child whose mother used too much alcohol during pregnancy may become imbecile and not behave well. Also, a pregnant woman may experience miscarriage from fighting with her husband and other persons".

However, income status did not affect participants understanding of the effects of teratogens. The participants from both high and low economic status described the consequences of teratogens extensively.

The responses to interview question four, which asked: Do you think people care about this? All the participants stated that not every pregnant woman understands the factors and consequences that could threaten their growth. Because of a lack of knowledge, some do not care about their behavior when pregnant. The level of care accorded to a pregnancy may depend on many factors, namely, the availability of a maternity center for an antenatal checkup, the duration one waits before conception, knowledge of teratogens, gravidity, superstitious beliefs, socio-economic status, prevailing environmental circumstances such as war, crises, and natural disasters such as earthquakes, landslides, wildfires, and droughts, among other factors. Some respondents further stated that some pregnant women do not accept all the teachings in antenatal checkups about dos and don'ts during pregnancy. Irrespective of the consequences of taking non-prescribed medications, some pregnant women consume herbal concoctions. One of the respondents from the urban area stated as follows:

"*The truth is not that some of us do not care about the consequences of teratogens, but not everything recommended in the hospital must be carried out. For example, I take Agbo herbal to reduce the weight of the fetus, and it has been quite helpful in my three previous pregnancies. Though medical doctors and nurses have always been against its use, they warned that it would affect my babies, but it never did."*

On the other hand, a respondent from the rural area postulated as follows:

"Most of us take care of our pregnancies. The only issue is that some things people describe as threats to pregnancies are not seen as such. For instance, stress is not a teratogen because most of us in this village go to the farm daily to engage in different types of strenuous work. Also, my husband always beats me when I'm pregnant, but those things never affected my pregnancy. In fact, it's only God who protects a fetus, not a woman's carefulness.".

The result further showed that participants from urban centers pay more attention to and care about their pregnancies than their counterparts from rural communities. Similarly, educated women reported taking more care of their pregnancies than those with lower educational qualifications. In the same vein, pregnant women with high socio-economic status reported showing more care and consciousness to their fetuses.

The interview question five asked respondents: What do you think should be done to prevent the consequences? The respondents adduced many useful practices that could be usefully utilized for the prevention of impacts of teratogenic manifestation. The practices include: prayers, sensitization of ladies from adolescence about the consequences of teratogens and how to prevent them; compulsory enrolment of couples in the training of the consequences of teratogens and the preventive measures immediately after marriage; training and retraining of nurses and other health workers about teratogens and preventive measures; a legal ban on the

consumption of alcohol; local herbal concoctions and procurement of non-prescribed medicine by pregnant women; in addition to the present teaching antenatal module; an audio recorded jingle about teratogens to be given to pregnant women freely; and regular medical checkups of pregnant women, among others.

The results revealed that there was no difference between participants from urban and rural areas, income status, or educational status on the recommendation of practices for the preventive measures of teratogens. One of the practices that participants from different divisions adduced was the incorporation of the concept of teratogens, consequences, and preventive measures into the school curriculum. One of the respondents stated as follows:

"*I think teratogens should be taught in secondary schools so that students can internalize them early in life and protect future generations from the dangers embedded in teratogens. This is because secondary school is a critical educational stage that coincides with the adolescence period, and most people are not yet married at this period.*"

Finally, the sixth study interview question, which asked "who should be involved in the campaign to prevent teratogenic conditions?" was explored. The respondents stated that the effort to curb teratogens is all-inclusive. Religious leaders, school teachers, community leaders, husbands, and governments at different levels should contribute to the prevention of teratogens. The religious leaders should ensure that intending couples undergo training about teratogens before their wedding. Also, teachers and school administrators should incorporate the training into the school curriculum for standardized teaching modules; the government should enact laws that ban pregnant women from engaging in behaviors that expose them to teratogens. For instance, some pregnant women tend to consume local herbs to reduce the weight of their fetus, which could lead to fetal alcohol syndrome and low-

birth-weight infants. The community leaders should help in driving the campaign to prevenalt teratogens. The findings further showed that there was no difference in responses of urban and r ural participants in terms of socio-economic status and educational level about people that should drive the campaign of prevention of teratogens.

Discussion

The study explored the knowledge and practices capable of preventing the manifestation of teratogens among selected pregnant women in urban and rural areas of Anambra State. Generally, all the respondents accepted knowing about teratogens. The results showed that the knowledge of teratogens differed in terms of educational level and locality. This finding is in tandem with Sharma (2021). However, there was no difference in knowledge of teratogens according to the income status of the participants. Also, the belief that witchcraft constitutes a threat to fetus development showed that health awareness is urgently required in rural communities. This is because, scientifically, witchcraft is not among the teratogens. Therefore, it is a superstitious belief that may inhibit right health-seeking behavior. There are some teratogens that were not known to the respondents, such as herbal concoctions meant to reduce the weight of the fetus and excess alcohol consumption, among others. Also, the results showed that the participants did not understand that some factors moderate the severity of the impacts of teratogens on the fetus, namely: dose of the teratogen exposed to, stage of pregnancy when the teratogen was exposed to, the chronological age of the mother, and genetic susceptibility of the mother (Finnell, 1999). Rather, some participants erroneously referred to the age of the mother as a teratogen.

Furthermore, the responses to the key interview question of how teratogens affect mothers and their fetuses revealed the level of understanding of the teratogens. The

highly educated respondents showed mastery of the array of consequences of prenatal hazards. In the same vein, results showed respondents with high income status had a broader knowledge of the consequences of teratogens than participants with low income status. This finding is in consonance with previous results that stated that level of education and socio-economic status contributed to health awareness (Raghupathi & Raghupathi, 2020; Winkleby & Cubbin, 2003; Winkleby et al., 1992). The locality did not show any difference in the understanding of teratogens. The explanations of concepts showed that both respondents from urban and rural areas have good knowledge of the consequences (Ndungi, 2017). The present finding is in disagreement with some previous empirical literature (American Psychological Association, 2017; Iversen & Kraft, 2006). However, the participants could not explain which of the hazards had particular consequences. Rather, they enumerated the consequences and lump them up. When the researcher asked some respondents to specifically mention a teratogen that could cause autism, they referred the researcher to a medical doctor or nurse.

The fourth interview question on the level of care accorded pregnancies revealed the impact of superstitious beliefs on the behaviors of pregnant women. It was discovered that pregnant women selectively decide which antenatal teachings to adopt or disregard. For instance, the consumption of herbal medicine that is believed to treat some diseases and reduce the weight of pregnancy was not perceived to threaten the fetus. Also, stress and other unhealthy behaviors, such as couples fighting during pregnancy, were not considered to negatively impact the fetus. It is plausible to note that some pregnant women who gave birth on the farm, at home, in a market place, on the road, or in a car may be as a result of non-adherence to teachings in antenatal centers. According to the findings, the majority of exposures to hazardous behaviors may not be the result of ignorance of the consequences of such actions but of non-adherence to antenatal procedure. The findings corroborate some previous findings that reported the impact of negligence on health crises (Odunsi,

2023; Olorunsuwa et al., 2022). The popular African maxim that" it is God that gives and protects life" manifested hugely in their responses. The attribution of human responsibility for care to God tends to exonerate the individuals from their obligation. Thus, it is capable of potentiating further indifference to health-related issues that matter. The respondents showed differences in locality, educational level, and income status. The finding is in line with previous research that found differences in demographic factors among participants (Ndungi, 2017; Raghupathi & Raghupathi, 2020).

Furthermore, the fifth and sixth questions, which asked for approaches to prevent the consequences and who should be involved in the campaign against teratogens, showed that all the participants explained the importance of teaching about teratogens in different settings. All the participants recommended for prenatal health advocacy by different people, ranging from church leaders, health workers, secondary school teachers, and community leaders, among others. Interestingly, all the respondents acknowledged prayers as a preventive measure against prenatal hazards. The recommendations were in line with the Federal Ministry of Health and the World Health Organization's supported programs for infants and maternal health in Nigeria.

Limitations of the Study

The study explored the knowledge and preventive practices prevalent in Anambra State, Nigeria. The participants were selected from both rural communities and urban area for the interview in order to achieve robust findings. Also, in order to elicit adequate information from the participants, a phenomenological design was adopted instead of quantitative survey research approach.

Implications of the Study

The study has implications for understanding and preventing the impacts of teratogens among pregnant women selected from both urban and rural communities, highly educated and lowly educated and high and low socio-economic status. Generally, participants knew some teratogens and preventive measures to mitigate the impacts. The implications could be broadly divided into two categories: theoretical implications and practical implications. Theoretically, the study has strengthened the health behavior model (Hochbaum & Rosentock, 1952), which postulated reasons for engagement in health-related actions. Secondly, it yielded important qualitative literature that would aid future research in this area. Practically, the study revealed the strong impact of superstitious beliefs on health-seeking behavior. The study showed similarities and differences among participants across education, locality, and socio-economic status. The study has revealed additional approaches to spreading the teaching of preventive measures not only to pregnant women but also to their husbands, who would help the wife adhere to healthy prenatal lifestyles. Also, people could start learning about teratogens at the secondary school level. Overall, the study showed the importance of running an all-inclusive campaign against teratogens.

Conclusion

The study provided evidence of some knowledge of teratogens by pregnant women from both urban and rural areas with different socio-economic status and educational levels. The highly educated and socio-economically privileged women showed more understanding of teratogens and their consequences than their counterparts. The participants from rural areas believed that witchcraft could affect fetuses negatively. Some information obtained from the antenatal clinic is not

utilized. The study has offered a new roadmap for advocacy and training on ways to enhance fetal and maternal health in Nigeria.

Conflict of Interest Declaration

The researcher hereby declares that there was no conflict of interest.

Funding Statement

There was no funding received for the study.

References

Adewuyi, E. O., Khanal, V., Zhao, Y., David, L., Bamidele, O. D., & Auta, A. (2019). Home childbirth among young mothers aged 15–24 years in Nigeria: a national population- based cross-sectional study. BMJ Open doi: 10.1136/bmjopen-2018-025494

Alonge, A. R., & Aluko, J. O. (2022) Maternal Anthropometric Status as A Correlate of Neonatal Outcomes Among Pregnant Women in Selected Secondary Health Facilities in Ibadan Metropolis, Oyo State, International Journal of Nursing, Midwife and Health Related Cases, 8(1), 11-23

American Psychological Association (2017). Education and Socioeconomic Status. Retrieved from https://www.apa.org/pi/ses/resources/publications/education BMJ Open. doi: 10.1136/bmjopen-2018-025494

Brajša-Žganec, A., Džida, M., Brkljačić, T., Kaliterna Lipovčan, L., & Lučić, L. (2023). The Well-Being of Parents in the Year After Childbirth. Journal of Family Issues, 44(9), 2446-2468. https://doi.org/10.1177/0192513X221096799

Chakrabarti, S. B., Tigga, M. P., Ray, J., Debbarma, A.. (2016). An eventful journey from menarche to successful motherhood. Journal of Human Reproductive Science 9(2):125-7. doi: 10.4103/0974-1208.183504. PMID: 27382240; PMCID: PMC4915284.

Chaudhary, G. & Sehgal, A. (2019). Teratogens. *International Journal of Emerging Technologies and Innovative Research* 6, (1), 305-308 *https://ssrn.com/abstract=3691088*

Dasgupta, P., Morton, J. F., Dodman, D., Karapinar, B., Meza, F., Rivera-Ferre, M. G., Toure-Sar, A., & Vincent, K. E. (2014). Rural Areas. In: Climate change 2014: Impacts, Adaptaion, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the fifth Assessment Report of the Intergovernmental Panel on climate change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 613 – 657.

Dijkstra, L., Hamilton, E., Lall, S. & Wahba, S. (2020). How do we define cities, towns, and rural areas? World Bank Blog. Retrieved from https://blogs.worldbank.org/en/sustainablecities/how-do-we-define-cities-towns-and- rural-areas

Dyrdal, G. M., & Lucas R. E. (2013). Reaction and adaptation to the birth of a child: A couple-level analysis. Developmental Psychology, 49(4), 749–761. https://doi.org/10.1037/a0028335

Finnell, R. H. (1999). Teratology: General considerations and principles. Journal of Allergy & Clinical Immunology 337 – 342.

Francis-Edoziuno, C. C., LaPlant, H. W. & Lucas, R. F. (2024). The Childbirth Experiences of First-Time Fathers from Nigeria. UCONN/School of Nursing DOI: 10.13140/RG.2.2.24131.17449

Hochbaum, A., & Rosentock, I. M. (1952). The Health Belief Model and Preventive Health

Behaviour. Health Education Monograph, 2(4), 354-386

Iversen, A. C., & Kraft, P., (2006). Does socio-economic status and health consciousness influence how women respond to health related messages in media?, Health Education Research, 21(5), 601–610, https://doi.org/10.1093/her/cyl014

Mishra, S., Semwal, J., Srivastava, A., Kumar, M. S. (2023). Prevalence of hyperglycemia in pregnancy and related screening practices in Rural Dehradun: The First population-based study from Uttarakhand (PGDRD-1). Indian Journal of Endocrinology & Metabolism 27: 145-53.

Ndungi, F. (2017). Socio-economic status, knowledge, awareness and attitudes of the Swahili community in relation to dietary habits, obesity and lifestyle

diseases. African Journal of Food, Agriculture, Nutrition and Development. DOI: 10.18697/ajfand.77.16335

Nwafor, C. E., Ofonedu, M., Nwankwo, N. I., Obuna, A., & Ugwu, P. C. (2022). Perceived stress moderates the relationship between family support and family quality of life among parents of children living with intellectual and developmental disabilities. Journal of Policy and Practice in Intellectual Disabilities, 1–9. https:// doi.org/10.1111/jppi.1242

Obiekwu, A. L., Mbadugha, C. J., Anetekhai, C. J., Isife, N. G., Kotoye, C. O. (2020). Self-reported compliance with routine prenatal medications by pregnant women in a tertiary hospital in Enugu State, Nigeria. European Journal of Midwifery, 4, 1-7. https://doi.org/10.18332/ejm/130595

Odunsi, B. (2023) Medical Negligence and Its Litigation in Nigeria. Beijing Law Review, 14, 1090-1122. doi: 10.4236/blr.2023.142058

Ojifinni, O. O., & Ibisomi, L. (2020). Preconception care practices in Nigeria: a descriptive qualitative study. Reproductive Health 17, 172 https://doi.org/10.1186/s12978-020- 01030-6

Olorunsuwa, E. O., Ajayi, A. D., Bot, M. D., & Baamshal, I. H. N. (2022). Medical Negligence And Challenges Of Healthcare Delivery In Nigeria: A Review Of Some Selected Cases. Global Journal of Health Related Researches, 4(1), 148 -156.

Raghupathi, V., Raghupathi, W. (2020). The influence of education on health: an empirical assessment of OECD countries for the period 1995–2015. *Archive of Public Health* 78(20). *https://doi.org/10.1186/s13690-020-00402-5*

Sharma, S. (2021). Teratogens. Retrieved from https://www.researchgate.net/publication/349928350_teratogens-170607085630

Szefler, M. W. (2014). The birth of the first child as a positive event in the lives of young parents. Polish Psychological Bulletin, 45 (2), 103 – 111. DOI – 10.2478/ppb-2014-0015

United Nations Children Education Funds, (UNICEF, 2024). Neonatal mortality. Retrieved from *https://data.unicef.org/topic/child-survival/neonatal-mortality/*

Winkleby M. A & Cubbin, C. (2003). Influence of individual and neighbourhood socio-economic status on mortality among black, Mexican-American and white women and men in the United States. Journal of Community Health 57, 444-452 doi:10.1136/jech.57.6.444

Winkleby, M. A., Jatulis, D. E., Frank, E., & Fortmann, S. P. (1992). Socio-economic status and health: How Education, Income, and Occupation contribute to Risk factors for Cardiovascular Disease. American Journal of Public Health, 82(6), 312-820

World Health Organization, (WHO, 2023). Trends in maternal mortality 2000 to 2020: estimates by WHO, UNICEF, UNFPA, World Bank Group and UNDESA/Population Division. Retrieved from https://www.who.int/publications/i/item/9789240068759.

World Health Organization, (WHO, 2024). Maternal Mortality. Retrieved from *https://www.who.int/news-room/fact-sheets/detail/maternal-mortality*.