Knowledge of Birth Defects and Fetal Growth Restriction Prevention among Antenatal Attendees in Ibadan South-East Local Government, Oyo State, Nigeria

Isaac Opeyemi Oguntunji[1*], Ireti Modupe Saidi[2], Joseph Oluwaseyi Adigun[3], Faith Yemioladapo Oguntunji[4], Aweda Abdullahi Salaudeen[5], Grace Abiodun Adesokan[6], Hezekiah Adebiyi Awojobi[7]

[1&6]Department of Human Kinetics & Health Education, Emmanuel Alayande University of Education, Oyo, Oyo State

[2]Department of Public Health, National Open University of Nigeria

[3]Department of Educational Foundation (Health Education Unit), Federal University of Lafia, Nasarawa, Nasarawa State

[4]Department of Public Health, Atiba University, Oyo

[5]Department of Public Health (Community Health), Rivers State University, Port Harcourt, Rivers State

[7]Primary Health Care Department, Oyo East Local Government Health Authority, Oyo

[*]Corresponding Author

DOI: https://doi.org/10.47772/IJRISS.2026.101000441

Received: 18 October 2026; Accepted: 27 October 2026; Published: 04 November 2026

ABSTRACT

Background: Birth defects and fetal growth restriction were among the adverse pregnancy outcomes, and contribute to neonatal mortality and lifelong disabilities.

Objective: This study assessed knowledge of birth defects and fetal growth restriction prevention among antenatal attendees in Ibadan South-East local government (IBSE LG), Oyo State, Nigeria.

Methodology: A descriptive research design of the survey type was adopted. The population of the study comprised 993 registered antenatal attendees at primary healthcare facilities in IBSE LG, Oyo State as at the time of study. A multi-stage sampling procedure was used to select 315 respondents for the study. A validated structured questionnaire was used for data collection. The reliability of the instrument was established using a Cronbach's alpha which yielded a reliability coefficient of 0.87. The research questions were answered using mean rating and ranking, frequency and percentage.

Results: The findings revealed that high number of antenatal attendees reported that alcohol consumption during pregnancy prevents the risk of developmental abnormalities in fetus (M = 4.19), with lowest score for the treatment of maternal infections (M = 4.06). Also, knowledge of regular antenatal care during pregnancy helps in promoting healthy fetal growth and development (M = 4.47), with lowest score for the regular monitoring of maternal weight during pregnancy (M = 4.04).

Conclusion: The study conclude that antenatal attendees had good knowledge of birth defect and fetal growth restriction prevention with low level of knowledge on treatment of maternal infections, management of chronic diseases, and regular monitoring of maternal weight during pregnancy.

Recommendations: During the antenatal clinic days, health educators should lay emphasis on the importance of prompt clinic-based care whenever they are sick. Also, health educators in collaboration with other health personnel should educate antenatal attendees on the need for periodic maternal weight measurement and effective management of life threatening diseases.

Keywords: Antenatal attendees, Birth defects**,** Fetal growth restriction, Knowledge, Prevention

INTRODUCTION

Birth defects and fetal growth restriction (FGR) are among the adverse pregnancy outcomes. Adverse pregnancy outcomes indicate poor birth outcomes other than normal pregnancy outcomes (Tsegaye & Kassa, 2018). Birth defect as a fetal health problem can contribute to neonatal mortality and lifelong disabilities (World Health Organization (WHO), 2023) so likewise FGR. It is expected that knowledge gained by antenatal attendees through an effective antenatal care health education sessions on avoidance of substance abuse, dangers of self medication, adequate antenatal care, medication adherence, periodical medical examination and screening, infection prevention, and early identification and reporting of pregnancy-related risks can prevent and reduce to the barest level the occurrence of birth defects and FGR. Antenatal attendees are pregnant women who registered in primary healthcare facilities for the purpose of antenatal care and delivery. Maternal health refers to women's health and well-being during pregnancy, childbirth and postpartum (Centre for Disease Control and Prevention (2024)). Islam (2017) posited that utilization of maternal health care services are important to identify the potential risks of pregnancy, ensure birth with skilled care, and improve the health of the mother and newborn.

Birth defect is synonymous to congenital abnormality, congenital anomaly, congenital disorder and congenital malformation. The Centre for Disease Control and Prevention (2023) defined birth defect as a structural change that is present at birth that can affect any part of the body such as foot, spinal cord, brain and heart to mention a few. An estimated 240,000 newborns die worldwide within 28 days of birth every year due to birth defects, and further cause 170,000 deaths of children between the ages of 1 month and 5 years (WHO, 2023). Also, about 303,000 infants die within the first month of birth because of defects (Heymann et al., 2016). Sub-Saharan Africa bears a disproportionate burden of congenital anomalies, with pooled prevalence rates reaching up to 23.5 per 1000 live births (Tetana et al., 2026). WHO (2023) asserted that 9 in 10 children born with a serious birth defects are in low-and middle-income countries. Approximately 3.2 million children are disabled throughout their life due to birth defects (Heymann et al., 2016). According to Tetana et al. (2026), contributory factors to the burden of birth defects include low maternal health literacy, poor access to prenatal vitamins, weak health infrastructure, and cultural practices that favour traditional over biomedical healthcare. Others may include genetics, infections, harmful radiation or drug exposure. Examples of defects are limb defects, cleft lip, and defects of the brain, heart, kidneys and body deformations.

Knowledge gained by antenatal attendees from antenatal clinic health education sessions can help their fetuses overcome the vulnerability to birth defects. However, Lawal et al. (2015) reported that only 4.9% of the respondents in their study claimed to have received information birth defects during antenatal clinics, 15.8% knew that birth defects could be prevented, 9.5% knew that birth defects can be prevented using folic acid, and 13.3% reported that certain tests could be used to assist in prenatal diagnosis of birth defects. In the study of Tetana et al. (2026), most respondents (77%) were aware of folic acid's roles in preventing birth defects, but only 31% understood the correct timing of supplementation that is, before conception or during the first trimester. Baschat (2026) asserted that taking a daily prenatal vitamin that includes at least 400 micrograms of folic acid can help prevent a variety of birth defects. It was further revealed that 93.06% acknowledged the harmful effects of alcohol consumption during pregnancy as one of the risk factors of birth defects, but only 13.89% believed that regular antenatal check-ups could help prevent birth defects (Tetana et al., 2026). Medical screening of pregnant women for birth defects diagnosis such as maternal blood screening/tests, ultrasounds, maternal serum screening and fetal echocardiogram among others is very important.

The term FGR is synonymous to intrauterine growth retardation, and intrauterine growth restriction. FGR it is a pathological condition that occurs as a result of failure of fetus to attain genetically maximum growth standard and thereby resulted into a major public or clinical health problems (Thekkedathu, 2015). American College of Obstetrician and Gynecology (ACOG), (2021) refers to FGR as the ultrasound-estimated fetal weight or abdominal circumference the 10th percentile for gestational age. It is a condition in which a fetus is unable to achieve its genetically determined potential size. FGR occurs when gas exchange and nutrient delivery to the fetus are not sufficient to allow it to thrive in utero (Michael, 2026). FGR occurs when a fetus fails to achieve its genetically determined growth potential, often because of placental insufficiency. It is associated with increased perinatal morbidity and mortality, impaired neurological development, and an elevated risk of cardiovascular diseases in adulthood (Colella et al., 2018). The research has shown that FGR can be associated with some underlying health issues in a pregnant women such as hypertension, maternal infection such as rubella and syphilis, fetal infection, maternal diabetes, renal insufficiency, autoimmune disease, substance abuse, smoking, malnutrition, fetus aneuploidy, thrombophiliasis, placental mosaicism, placenta previa, nultiple gestations, chromosomal disorders and velamentous cord insertion (ACOG, 2021; Melamed et al., 2021). In a situation whereby placenta fails to supply sufficient nutrients and required oxygen to the fetus or in case of crisis in placenta to supply blood, the fetus may experience growth restriction.

Adequate knowledge of pregnant women plays a vital role in preventing FGR. In a cross-sectional study involving 381 pregnant women in Lishusi city, China, Zhu et al. (2025) reported a mean FGR knowledge score of 11.08 $\pm$ 5.44 out of 22 indicating limited overall knowledge. Although the participants reported favourable preventive practices in which 87.40% strongly agreed that they would avoid smoking and alcohol, 84.78% opined that they would avoid medication that could affect fetal growth, 73.23 agreed that they would adhere to recommended pregnancy weight-gain targets, and 75.59% agreed that they would ensure adequate energy and protein intake (Zhu et., 2025). Wen and Liu (2023) revealed that exposure of pregnant women to health education could help in reducing the occurrence of FGR. One of the routines during antenatal visit is estimation of the size of babies during pregnancy by measuring the distance between the mother's fundus and the pubic bone. At about twenty weeks of pregnancy, the measurement using centimeters rule normally equal with the number of weeks of expectant mothers' pregnancies. The short fall in the measurement is an indication that the baby might not grow as expected if the fetus is below 10th percentile of gestational age and at times, a medical examination test might be run in a laboratory for confirmation (Schlaudecker et al., 2017).

Statement of the Problem

Birth defects and FGR are important fetal health concerns associated with adverse pregnancy outcomes. Maternal knowledge of their factors and preventive measures is important for promoting fetal health. In a study among 415 antenatal attendees at the University College Hospital, Ibadan, Akinmoladun et al. (2021) reported that only 52.8% had good overall knowledge of birth defects, while 56.4% had good knowledge of their prevention. Similarly, Zhu et al. (2025), in a study of 381 pregnant women in China, reported a mean FGR knowledge score of 50.36% of the maximum obtainable score, indicating limited knowledge. Although these studies provide evidence of limitations in pregnant women's knowledge of birth defects and FGR, however, the findings from China cannot automatically be generalized to pregnant women in Nigeria.

Furthermore, the Ibadan study by Akinmoladun et al. (2021) focused on birth defects rather than FGR prevention. The extent to which antenatal attendees at primary healthcare facilities in IBSE LG possess adequate knowledge of birth defects and FGR prevention therefore requires investigation. To the best of the knowledge of the researchers, there are no empirical findings in IBSE LG that assessed knowledge of birth defects and FGR prevention among antenatal attendees combined together. Therefore, this study assessed knowledge of birth defects and fetal growth restriction prevention among antenatal attendees in Ibadan South-East local government, Oyo State, Nigeria.

Research Questions

The following questions were answered in this study:

1. What is the level of knowledge of antenatal attendees regarding the prevention of birth defects in Ibadan South-East local government, Oyo State, Nigeria?
2. What is the level of knowledge of antenatal attendees regarding the prevention of fetal growth restriction in Ibadan South-East local government, Oyo State, Nigeria?

METHODOLOGY

A descriptive research design of the survey type was adopted. It was a clinic-based study. The population of the study comprised 993 registered antenatal attendees at primary healthcare facilities in IBSE LG as at the time of data collection. The study was conducted from December 2022 to March 2023. A multi-stage sampling technique was used to select 315 respondents for the study. In the stage one, a simple random sampling technique was used to select 7 primary healthcare facilities. In the stage two, a proportionate sampling technique was used to determine the respondents per each facility based on their population. In the third stage, a systematic random sampling technique was used to select the final respondents from each facility whereby every 2nd antenatal attendees were selected for the study. A structured questionnaire was used for data collection. It was validated by three experts in the area of Public Health. Both face and content validity of the instrument was done. Ambiguity of words and medical-related terms were eliminated to avoid wrong interpretation of the items. The comments and suggestions of those experts were incorporated into the final draft of the instrument. An agreement-based mean-rating was used to classify respondents as having adequate and inadequate knowledge. In the knowledge scoring criteria, mean score 2.50 and above culminated into "agree", while below 2.50 was "disagree". The knowledge items were rated using a four-point Likert-rating scale of Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1. The reliability of the instrument was carried out using Cronbach's alpha and a coefficient of 0.87 was obtained. Ethical approval for the study was obtained from Ministry of Health, Department of Planning, Research & Statistics Division with reference number AD 13/479/399. Consent of each head of facility and respondent were sought, confidentiality of the information obtained was pledged, and the participation in the study was made voluntary. Questionnaire administration was done during the various antenatal clinic days in each facility. In the analysis, the mean ratings were used to summarize respondents' response to each knowledge statement, while the items were ranked according to their mean scores. Responses of SA and A were grouped as adequate responses, while D and SD were grouped as inadequate responses. Frequencies and percentages were used to describe the distribution of responses for each knowledge item. The adequate/inadequate classification was applied at the individual item level.

RESULTS

Table 1a: Mean Rating and Ranking of Antenatal Attendees' Responses on Knowledge of Prevention of Birth Defects in IBSE LG, Oyo State, Nigeria

N = 315

S/n	Birth Defect Prevention Knowledge Items	Mean	Rank	Decision
1	Awareness of the importance of avoiding harmful radiation during pregnancy helps prevent brain, spinal cord and other abnormalities in the developing fetus.	4.09	4th	Agreed
2	Understanding the roles of regular antenatal care helps in reducing the risk of abnormalities in the growth and development of the unborn child.	4.10	3rd	Agreed
3	Recognizing that alcohol consumption during pregnancy prevents the risk of heart, brain, and developmental abnormalities in the fetus.	4.19	1st	Agreed
4	Knowledge of the importance of taking folic acid before conception and during early pregnancy helps prevent brain and spinal cord abnormalities in the fetus.	4.16	2nd	Agreed
5	Understanding the place of adequate treatment of maternal infections during pregnancy helps in preventing fetal abnormalities.	4.06	5th	Agreed
	Grand Mean	**4.12**		**Agreed**

Decision Criterion: Mean score 2.50 & above = Agreed; Mean score below 2.50 = Disagreed

Table 1a shows the level of knowledge of antenatal attendees regarding the birth defect prevention. The mean scores ranged from 4.06 – 4.19, all of which were above the decision criterion of 2.50, indicating

agreement with all the statements. The highest rated item was "recognizing that alcohol consumption during pregnancy prevents the risk of heart, brain, and developmental abnormalities in the developing fetus" (M = 4.19) which ranked 1st, while the lowest rated item was "understanding the place of adequate treatment of maternal infections during pregnancy helps in preventing fetal abnormalities" (M = 4.06) which ranked 5th.

Table 1b: Distribution of Adequate and Inadequate Responses to Birth Defect Prevention Knowledge Items among Antenatal Attendees at Primary Healthcare Facilities in IBSE LG, Oyo State, Nigeria

S/n	Birth Defect Prevention Knowledge Items	Adequate	Inadequate	Row Total
1	Avoiding of harmful radiation during pregnancy	261(82.9%)	54(17.1%)	315
2	Regular antenatal care	267(84.8%)	48(15.2%)	315
3	Alcohol avoidance during pregnancy	286(90.8%)	29(9.2%)	315
4	Intake of folic acid before conception and during early pregnancy	286(90.8%)	29(9.2%)	315
5	Adequate treatment of maternal infections during pregnancy	256(81.3%)	5918.7%)	315

Table 1b presents the distribution of adequate and inadequate responses to the birth defect prevention knowledge items among antenatal attendees at primary healthcare facilities in IBSE LG, Oyo State, Nigeria. The results show that adequate responses to birth defects prevention were most frequent among antenatal attendees for alcohol avoidance and intake of folic acid both at (90.8%). In contrast, inadequate responses to birth defects prevention were most frequent among antenatal attendees for treatment of maternal infection (18.7%), and followed by harmful radiation (17.1%).

Table 2a: Mean Rating and Ranking of Antenatal Attendees' Responses on Knowledge of Prevention of Fetal Growth Restriction in IBSE LG, Oyo State, Nigeria

N = 315

S/n	**Fetal Growth Restriction Prevention Items**	**Mean**	**Rank**	**Decision**
1	Knowledge of early detection and proper management of diabetes and other chronic health conditions during pregnancy help reduce the risk of impaired fetal growth.	4.01	4th	Agreed
2	Having knowledge of adequate nutrition during pregnancy helps prevent impaired fetal growth.	4.37	2nd	Agreed
3	Knowledge of regular antenatal care during pregnancy helps in promoting healthy fetal growth and development.	4.47	1th	Agreed
4	Understanding of regular monitoring of maternal weight during pregnancy helps to identify potential threat to fetal growth.	4.04	5th	Agreed
5	Awareness of routine ultrasound examination during pregnancy helps in early detection of conditions associated with poor fetal growth and development.	4.22	3rd	Agreed
	Grand Mean	**4.22**		**Agreed**

Decision Criterion: Mean score 2.50 & above = Agreed; Mean score below 2.50 = Disagreed

Table 2a revealed the level of knowledge of antenatal attendees regarding the fetal growth restriction prevention. The mean scores ranged from 4.04 – 4.47 all of which were above the decision criterion of 2.50, indicating agreement with all the statements. The highest rated item was "knowledge of regular antenatal care during pregnancy helps in promoting healthy fetal growth and development" (M = 4.47), which ranked 1st, while the lowest rated item was "understanding of regular monitoring of maternal weight during pregnancy helps to identify potential threat to fetal growth" (M = 4.04) which ranked 5th.

Table 2b: Distribution of Adequate and Inadequate Responses to Fetal Growth Restriction Prevention Knowledge Items among Antenatal Attendees at Primary Healthcare Facilities in IBSE LG, Oyo State, Nigeria

S/n	Fetal Growth Restriction Prevention Items	Adequate	Inadequate	Row Total
1	Early detection and management of chronic health conditions	245(77.8%	70(22.2%)	315

2	Adequate nutrition during pregnancy	305(96.8%)	10(3.2%)	315
3	Regular antenatal care during pregnancy	306(97.1%)	9(2.9%)	315
4	Regular monitoring of maternal weight during pregnancy	237(75.2%)	78(24.8%)31	315
5	Routine ultrasound examination during pregnancy	284(90.2%)	31(9.8%)	315

Table 2b shows the distribution of adequate and inadequate responses to the fetal growth restriction prevention knowledge items among antenatal attendees at primary healthcare facilities in IBSE LG, Oyo State, Nigeria. The results show that adequate responses to fetal growth restriction prevention were most frequent among antenatal attendees for regular antenatal care during pregnancy (97.1%), followed by adequate nutrition during pregnancy (96.8%). In contrast, inadequate responses to fetal growth restriction prevention were most frequent among antenatal attendees for regular monitoring of maternal weight during pregnancy (24.8%) followed by early detection and management of chronic health conditions (22.2%).

DISCUSSION

The findings in the Table 1a and 1b indicated that antenatal attendees at primary healthcare facilities in IBSE LG reported different levels of knowledge regarding the birth defect prevention. This is evidenced by the grand mean of 4.12, which is above the decision criterion of 2.50. Antenatal attendees who formed the respondents agreed with all the statement suggesting that they were knowledgeable about the importance of preventive measures such as alcohol avoidance (M = 4.19), taking folic acid (M = 4.16), attending regular antenatal care (M = 4.10), avoiding harmful radiation (M = 4.09), and adequate treatment of maternal infections during pregnancy (M = 4.06). However, the mean score for the item 5 "adequate treatment of maternal infections during pregnancy helps prevent fetal abnormalities" had the mean score 4.06, suggesting that antenatal attendees were relatively less knowledgeable about the roles of adequate treatment of maternal infection during pregnancy in birth defects prevention compared with other aspect assessed. The findings generally imply that most antenatal attendees who formed the respondents reported adequate knowledge of measures that can help in preventing birth defects. However, their knowledge on treatment of maternal infection and avoidance of harmful radiation need attention. The findings corroborate result of Tetana et al. (2026) whereby most of their respondents (77%) were well aware of folic acid's roles in preventing birth defects, although only 31% understood the correct timing of the supplementation. Again, 93.06% of their respondents acknowledged the harmful effects of alcohol consumption during pregnancy as one of the risk factors of birth defects. Only 13.89% believed that regular antenatal check-ups could help in preventing birth defects (Tetana et al., 2026).

The findings in the Table 2a and 2b revealed that antenatal attendees at primary healthcare facilities in IBSE LG reported different level of knowledge regarding the fetal growth restriction prevention. This is evidenced by the grand mean of 4.22, which is above the decision criterion of 2.50. Antenatal attendees who formed the respondents agreed with all the statement suggesting that they reported adequate knowledge about regular antenatal care during pregnancy (M = 4.47), adequate nutrition during pregnancy (M = 4.37) and routine ultrasound examination during pregnancy (M = 4.22) as fetal growth restriction preventive measures. Although antenatal attendees reported knowledge of early detection and management of chronic diseases (M = 4.01), and regular monitoring of maternal weight during pregnancy (M = 4.04), yet their mean ratings were comparatively low. The findings generally imply that most antenatal attendees who formed the respondents possessed adequate knowledge of measures that can help in preventing fetal growth restriction. However, their knowledge on management of chronic infection and maternal weight monitoring need attention. The findings resonates with the report of Zhu et al. (2025) in which most respondents reported favourable FGR preventive practices which include avoidance of smoking (87.40%), avoidance of medications that can affect fetal growth (84.40%), adherence to recommended pregnancy weight-gain targets (73.23%), and adequate energy protein intake (75.59%).

CONCLUSION

Based on the findings of the study, the study concludes that:

1. Antenatal attendees had adequate knowledge of birth defects prevention with inadequate knowledge on treatment of maternal infections and harmful radiation during pregnancy.
2. Antenatal attendees had adequate knowledge of fetal growth restriction prevention with inadequate knowledge on management of chronic diseases and regular monitoring of maternal weight during pregnancy.

RECOMMENDATIONS

Based on the conclusion of the study, it is recommended that:

1. During the antenatal care health education session, health personnel should lay a greater emphasis on the importance of prompt clinic-based care among pregnant women whenever they are sick and adequate protection from radioactive materials.
2. Health educators in collaboration with other health personnel should educate pregnant women during antenatal clinic days on the need for periodic maternal weight measurement and effective management of life threatening diseases.

ACKNOWLEDGEMENTS

The authors acknowledged all antenatal attendees who participated and supplied information during the period of the study. All authors cited in this work are highly appreciated.

Limitations of the Study

The cross-sectional design of this study limited the study to the period of data collection. The study cannot establish changes in knowledge overtime or determine whether antenatal health education influenced the knowledge reported by the respondents. Also, the study assessed knowledge rather than pregnancy outcomes. The findings did not establish a causal relationship between respondents' knowledge and the actual prevention of birth defects or fetal growth restriction. The clinic-based nature of the study which involved antenatal attendees from selected primary healthcare facilities in Ibadan South-East LGA limits the generalization of the findings to pregnant women in other settings. Finally, the study did not investigate any association between respondents' socio-economic characteristics and their knowledge of birth defects and fetal growth restriction prevention. Therefore, it cannot establish which characteristics influence their responses.

Conflict of Interest

The authors declare no conflict of interest.

REFERENCES

1. Akinmoladun, J. A., Uchendu, O. C., Lawal, T. A., & Oluwasola, T. A. (2021). Awareness and knowledge of birth defects among antenatal clinic attendees at the University College Hospital, Ibadan, South-West, Nigeria. West African Journal of Medicine, 38(6), 531–536.
2. American College of Obstetricians and Gynecologists. (2021). Fetal growth restriction: ACOG practice bulletin number 227. Obstetrics & Gynecology, 137(2), e16–e28. https://doi.org/10.1097/AOG.0000000000004251
3. Baschat, A. A. (2026). Preventing and treating birth defects: What you need to know. Johns Hopkins Medicine. Retrieved July 29, 2026, from https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/preventing-and-treating-birth-defects-what-you-need-to-know
4. Centre for Disease Control and Prevention. (2024). Maternal health. Retrieved July 15, 2025, from https://www.cdc.gov/cdi/indicatordefinitions/maternal-health.html
5. Centre for Disease Control and Prevention. (2023). What are birth defects? Retrieved April 3, 2023, from https://www.cdc.gov/ncbddd/birthdefects/facts.html#ref

6. Colella, M., Frerot, A., Rideau, A., Novai, B., & Baud, O. (2018). Neonatal and long-term consequences of fetal growth restriction. Current Pediatric Reviews, 14(4), 212–218. https://doi.org/10.2174/1573396314666180712114531
7. Heymann, D. L., Hodgson, A., Sall, A. A., Freedman, D. O., Staples, J. E., Althabe, F., Baruah, K., Mahmud, G., Kandun, N., Vasconcelos, P. F., Bino, S., & Menon, K. U. (2016). Zika virus and microcephaly: Why is this situation a PHEIC? The Lancet, 387(10020), 719–721. https://doi.org/10.1016/S0140-6736(16)00320-2
8. Islam, R. M. (2017). Utilization of maternal health care services among indigenous women in Bangladesh: A study on the Mru tribe. Women & Health, 57(1), 108–118. https://doi.org/10.1080/03630242.2016.1153020
9. Lawal, T. A., Yusuf, O. B., & Fatiregun, A. A. (2015). Knowledge of birth defects among nursing mothers in a developing country. African Health Sciences, 15(1), 180–187. https://doi.org/10.4314/ahs.v15i1.24
10. Melamed, N., Baschat, A., Yinon, Y., Athanasiadis, A., Mecacci, F., Figueras, F., Berhgella, V., Nazareth, A., Tahlak, M., Mclntyre, H. D., Da Silva, Costa, F., Kihara, A. B., Hadar, E., McAuliffe, F., Hanson, M., Ma, R. C., Gooden, R., Sheiner, E., Kapur, A., Divakar, H., Ayre-de-Campos, D., Hiersch, L., Poon, L. C., Kingdom, J., Romero, R., & Hod, M. (2021). FIGO (International Federation of Gynecology and Obstetrics) initiative on fetal growth: Best practice advice for screening, diagnosis, and management of fetal growth restriction. International Journal of Gynaecology and Obstetrics, 152(Suppl.), 3–57. https://doi.org/10.1002/ijgo.13522
11. Michael, G. R. (2026). Fetal growth restriction. Obstetrics & Gynecology. Retrieved October 10, 2026, from https://emedicine.medscape.com/article/261226-overview#a8
12. Schlaudecker, E. P., Munoz, F. M., Bardají, A., Boghossian, N. S., Khalil, A., Mousa, H., Nesin, M., Nisar, M. I., Pool, V., Spiegel, H. M. L., Tapia, M. D., Kochhar, S., & Black, S. (2017). Brighton Collaboration Small for Gestational Age Working Group. Small for gestational age: Case definition and guidelines for data collection, analysis, and presentation of maternal immunization safety data. https://doi.org/10.1016/j.vaccine.2017.01.040
13. Tetana, T., Milambo, M. J. P., & Benjamin, L. (2026). Maternal knowledge, attitude, and practices towards the prevention of birth defects in Eastern Cape, South Africa: A multi-level contextual analysis. International Journal of Environmental Research and Public Health, 23(6), 742. https://doi.org/10.3390/ijerph23060742
14. Thekkedathu, V. C. A. (2015). Maternal and placental risk factors associated with intrauterine growth restriction and the perinatal outcomes. Journal of South Asian Federation of Obstetrics and Gynaecology, 7(3), 176–181.
15. Tsegaye, B., & Kassa, A. (2018). Prevalence of adverse birth outcome and associated factors among women who delivered in Hawassa town governmental health institutions, South Ethiopia, in 2017. Reproductive Health, 15(1), 1–10. https://doi.org/10.1186/s12978-018-0631-3
16. Wen, J., & Liu, X. (2023). Effects of information-knowledge-attitude-practice health education combined with cluster-based care in patients with gestational hypertension. Medicine, 102, e35346. https://doi.org/10.1097/MD.0000000000035346
17. World Health Organization. (2023). Congenital disorders. Retrieved October 11, 2026, from https://www.who.int/news-room/fact-sheet/detail/birth-defects
18. Zhu, Y., Ding, C., Fang, L., Mei, Z., & Xie, X. (2025). Knowledge, attitude, and practices of pregnant women regarding fetal growth restriction: A cross-sectional study. Frontiers in Public Health, 13, 1567038. https://doi.org/10.3389/fpubh.2025.1567038