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The Impact of Obstetric Care Education on Prenatal Health Behaviors among Pregnant Women

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Abstract

Maternal health behaviors are critical determinants of pregnancy outcomes and maternal well-being. This study aimed to examine the effect of obstetric care education on prenatal health behaviors among pregnant women and to evaluate the role of knowledge improvement in facilitating behavioral change. A quantitative quasi-experimental design with pre-test–post-test control groups was employed involving 120 pregnant women attending antenatal care services. Data were collected using validated knowledge and prenatal health behavior instruments and analyzed through paired-sample t-tests, independent-sample t-tests, repeated-measures ANOVA, and multiple regression analysis. The findings revealed significant improvements in maternal knowledge and prenatal health behaviors following participation in the educational intervention. Women in the intervention group demonstrated significantly healthier behaviors than those receiving routine care, while behavioral gains were largely maintained during follow-up assessment. These findings highlight the importance of integrating structured obstetric care education into routine maternal healthcare services to enhance health literacy, strengthen preventive behaviors, and improve maternal health outcomes.

INTRODUCTION

Maternal health remains a critical global public health priority despite substantial improvements in healthcare systems and obstetric services over the past decades. According to recent international reports, preventable maternal and neonatal complications continue to contribute significantly to morbidity and mortality, particularly in low- and middle-income countries where access to quality healthcare and health information remains uneven. Prenatal health behaviors including regular antenatal care attendance, adequate nutrition, engagement in safe physical activity, adherence to medical recommendations, and avoidance of harmful substances have consistently been identified as key determinants of pregnancy outcomes and maternal well-being (Beulen et al., 2021; Nguyen et al., 2022; Lange et al., 2023; Romero-Barranca et al., 2024; Obeagu & Alsadi, 2025). Evidence suggests that women who adopt healthy prenatal behaviors are more likely to experience favorable pregnancy outcomes, whereas inadequate health practices increase the risk of

preterm birth, low birth weight, maternal complications, and long-term developmental problems among children (Kim et al., 2024; Ahmed et al., 2024; Odchigue, 2025).

The growing recognition of behavioral determinants in maternal health has shifted attention from purely clinical interventions toward educational and preventive strategies (Souza et al., 2024; Aidoo, 2025). Among these approaches, obstetric care education has emerged as a fundamental component of antenatal services. Obstetric education refers to structured learning activities designed to improve maternal knowledge, awareness, decision-making capacity, and self-management during pregnancy (Lin et al., 2023; Wen et al., 2025; Rezaei et al., 2025). Previous studies have demonstrated that educational interventions can positively influence maternal attitudes and behaviors by enhancing understanding of nutritional requirements, pregnancy danger signs, birth preparedness, and health-seeking practices (Grenier et al., 2021; Mate et al., 2021; Gregory et al., 2024). Consequently, healthcare systems increasingly regard education as a cost-effective intervention capable of generating sustainable improvements in maternal and neonatal outcomes.

Recent empirical evidence supports the effectiveness of prenatal educational programs across diverse settings. Systematic reviews indicate that nutrition counseling and maternal education interventions contribute significantly to improved dietary intake, increased compliance with antenatal care recommendations, and enhanced birth outcomes (Dewidar et al., 2023; Doherty et al., 2022). Similarly, educational initiatives have been associated with increased breastfeeding intentions, greater utilization of maternal healthcare services, and improved self-efficacy among pregnant women (Killeen et al., 2022; Wang & Chang, 2023; Koruk et al., 2025). Beyond physical health outcomes, obstetric education also affects psychosocial dimensions of pregnancy. Educational support delivered by healthcare professionals has been shown to reduce maternal anxiety, strengthen confidence in childbirth preparation, and improve perceived control over pregnancy-related decisions (Super et al., 2021; Herzog-Petropaki et al., 2022). These findings suggest that education functions not only as a knowledge-transfer mechanism but also as a behavioral empowerment strategy.

The theoretical foundation underpinning educational interventions in maternal health is largely informed by behavioral change theories, particularly the Health Belief Model and health literacy frameworks. These perspectives propose that individuals are more likely to adopt healthy behaviors when they perceive susceptibility to health risks, understand the benefits of preventive actions, and possess sufficient knowledge to make informed decisions (Pope et al., 2022; Bas-Sarmiento et al., 2022; Guo et al., 2023). In maternal healthcare contexts, enhanced health literacy has been consistently linked to improved antenatal attendance, nutritional compliance, and engagement with healthcare services (Benedetto et al., 2024). However, the effectiveness of educational interventions is often influenced by sociodemographic characteristics, including educational attainment, socioeconomic status, age, and parity, which may affect how health information is understood and translated into behavior (Francis et al., 2021; Sabetghadam et al., 2022; Wang et al., 2022; Shutsko, 2022; Dally et al., 2024; Hjorth et al., 2025).

Despite the substantial body of literature supporting maternal education, important conceptual and empirical limitations remain. First, many existing studies focus on isolated outcomes such as breastfeeding practices, iron supplementation adherence, nutritional behavior, or birth preparedness rather than examining prenatal health behaviors as a multidimensional construct (Nguyen et al., 2021; Billah et al., 2022; Noptriani & Simbolon, 2022). Second, previous research has predominantly evaluated knowledge acquisition, while relatively fewer studies have investigated whether increases in knowledge are translated into measurable and sustained

behavioral change. Research indicates that educational interventions often improve maternal knowledge immediately after implementation, yet evidence regarding long-term behavioral retention remains inconsistent (Rockliffe et al., 2021; Yuhas et al., 2022; Sanas & Resky, 2025). Third, the majority of studies emphasize clinical outcomes while overlooking the managerial implications of integrating educational programs into routine maternal healthcare systems.

Furthermore, substantial contextual challenges continue to affect maternal health promotion efforts in developing countries. Structural barriers such as limited healthcare accessibility, economic constraints, cultural beliefs, and disparities in health literacy frequently reduce the effectiveness of conventional antenatal interventions (Karyadi et al., 2023; Rasmussen et al., 2023). Consequently, there is a growing need for evidence-based educational strategies capable of addressing these challenges while simultaneously strengthening maternal healthcare delivery. Understanding how structured obstetric care education influences a broad range of prenatal health behaviors therefore represents both a theoretical and practical priority for maternal health management (Luo, 2025; Beressa et al., 2025).

The present study addresses these gaps by examining the comprehensive impact of structured obstetric care education on prenatal health behaviors among pregnant women. Unlike previous studies that focus on single behavioral outcomes, this research evaluates multiple dimensions of prenatal behavior, including antenatal care adherence, nutritional practices, physical preparedness, and avoidance of harmful behaviors. The novelty of this study lies in its integrated assessment of knowledge improvement, behavioral change, and behavioral sustainability using a quasi-experimental design. Additionally, this research extends existing literature by positioning obstetric care education not only as a clinical intervention but also as a strategic management instrument for improving maternal healthcare delivery. Therefore, the objective of this study is to analyze the effect of obstetric care education on prenatal health behaviors among pregnant women and to identify the extent to which educational interventions contribute to sustained behavioral improvement. The findings are expected to contribute theoretically to maternal health behavior research and practically to the development of evidence-based educational policies and antenatal care management strategies.

METHODS

Research Design

This study employed a quantitative approach using a quasi-experimental pre-test–post-test control group design to examine the effectiveness of obstetric care education in improving prenatal health behaviors among pregnant women. A quasi-experimental design was selected because it allows the evaluation of causal relationships in real-world healthcare settings where random assignment is often impractical or ethically constrained (Liu & Panagiotakos, 2022; Polit & Beck, 2021). The study compared behavioral outcomes between an intervention group receiving structured obstetric care education and a control group receiving routine antenatal care services. Measurements were conducted at baseline, immediately after the intervention, and four weeks following the intervention to assess both immediate and sustained behavioral changes.

Research Setting and Participants

The study was conducted in maternal and child health centers located in the selected research area, which serve as primary healthcare facilities for antenatal services. These facilities were chosen because they routinely provide maternal healthcare and represent the typical context in which obstetric education programs are delivered. The target population consisted of pregnant women in their second trimester of

pregnancy (14–28 weeks gestation), a critical period during which prenatal education can effectively influence maternal health behaviors before childbirth.

A total of 120 pregnant women participated in the study and were equally allocated to intervention and control groups (n = 60 per group). Participants were recruited using purposive sampling based on predefined inclusion criteria, including active attendance at antenatal care services, gestational age between 14 and 28 weeks, and willingness to participate through informed consent. Women with high-risk pregnancies requiring specialized medical management or conditions that could limit participation in educational activities were excluded. The sample size was determined through statistical power analysis to ensure adequate power (0.80) and a confidence level of 95% for detecting significant differences between groups.

Intervention and Data Collection Procedures

The intervention consisted of a structured obstetric care education program delivered over four consecutive weeks. Each session lasted approximately 60 minutes and was facilitated by trained maternal health professionals. The educational curriculum was developed and validated by experts in obstetrics, midwifery, and public health education to ensure content accuracy and contextual relevance. Core topics included maternal nutrition, antenatal care adherence, recognition of pregnancy danger signs, safe physical activity during pregnancy, birth preparedness, and avoidance of harmful behaviors such as smoking and alcohol consumption.

Data were collected using two standardized instruments. The first was a prenatal health knowledge questionnaire containing 25 multiple-choice items assessing participants' understanding of pregnancy-related health issues. The second instrument was a Prenatal Health Behavior Scale measuring dietary practices, antenatal attendance, physical activity, and avoidance of risk behaviors using a five-point Likert scale ranging from "never" to "always." Data collection was conducted at three time points: pre-test (baseline), post-test 1 (immediately after intervention), and post-test 2 (four weeks after intervention). Trained research assistants administered all questionnaires through face-to-face interviews to minimize response bias and improve data completeness.

Validity and Reliability

To ensure methodological rigor, both instruments were adapted from previously validated maternal health assessment tools and underwent expert review for content validity. A pilot study involving 20 pregnant women outside the main sample was conducted to evaluate instrument clarity and reliability. Internal consistency testing demonstrated satisfactory reliability, with Cronbach's alpha coefficients exceeding the recommended threshold of 0.80, indicating high reliability. Construct validity was further supported through expert evaluation and alignment with established theoretical frameworks related to maternal health behavior and health literacy.

Data Analysis

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize participant characteristics and baseline measurements. Inferential analyses were conducted to test the study hypotheses. Paired-sample t-tests were applied to assess changes in knowledge scores within the intervention group, while independent-sample t-tests compared post-intervention behavioral outcomes between intervention and control groups. Repeated-measures ANOVA was used to evaluate behavioral changes across the three measurement periods and determine the sustainability of intervention effects. Multiple regression analysis was subsequently performed to identify sociodemographic predictors of

post-intervention prenatal health behavior. Statistical significance was established at $p < 0.05$.

RESULTS AND DISCUSSION

This section presents the empirical findings of the study regarding the effectiveness of obstetric care education in improving prenatal health knowledge and behaviors among pregnant women. The results are organized into five parts. First, participant characteristics are presented to provide contextual information about the study sample. Second, changes in maternal knowledge following the educational intervention are examined. Third, differences in prenatal health behaviors between intervention and control groups are analyzed. Fourth, changes in behavioral outcomes across three measurement periods are evaluated. Finally, factors predicting post-intervention prenatal health behaviors are identified using multiple regression analysis.

Participant Characteristics

Prior to examining the intervention effects, participant characteristics were analyzed to describe the demographic profile of the respondents.

Table 1. Demographic Characteristics of Participants (N = 120)

Variable	Category	n	%
Age	<25 years	28	23.3
	25–34 years	67	55.8
	≥35 years	25	20.9
Education	Primary School	22	18.3
	Secondary School	58	48.3
	Higher Education	40	33.4
Parity	Primigravida	46	38.3
	Multigravida	74	61.7
Employment Status	Employed	52	43.3
	Unemployed/Housewife	68	56.7

Source: Primary survey data processed by the authors, 2025

Table 1 indicates that the majority of participants were between 25 and 34 years of age (55.8%), representing the most common reproductive age group. Nearly half of the respondents had completed secondary education (48.3%), while one-third possessed higher educational qualifications (33.4%). Most participants were multigravida women (61.7%), indicating previous pregnancy experience. The demographic profile suggests that the sample adequately represented women commonly attending antenatal care services.

Impact of Obstetric Care Education on Maternal Knowledge

The first objective was to evaluate whether structured obstetric care education improved maternal knowledge regarding prenatal health management.

Table 2. Effect of Obstetric Care Education on Maternal Knowledge Scores (n = 60)

Test Condition	Mean	SD	t	df	p-value
Pre-test	12.45	3.21			
Post-test	18.72	2.95	14.62	59	<0.001

Source: Primary survey data processed by the authors, 2025

The findings demonstrate a substantial improvement in maternal knowledge following participation in the educational intervention. The average score increased from 12.45 before the intervention to 18.72 after completion of the educational

sessions. The paired-sample t-test revealed a highly significant difference between measurements (t = 14.62, p < 0.001). The increase of 6.27 points indicates that the intervention successfully improved participants' understanding of maternal nutrition, antenatal care attendance, recognition of danger signs, birth preparedness, and healthy pregnancy practices. The reduced variability observed in post-test scores suggests that educational exposure contributed to more consistent levels of understanding among participants. The calculated Cohen's d effect size was estimated at 1.88, indicating a very large intervention effect. This finding confirms that obstetric care education substantially enhanced maternal health literacy.

Differences in Prenatal Health Behaviors Between Groups

The second objective examined whether women receiving obstetric education demonstrated healthier prenatal behaviors than those receiving routine antenatal care alone.

Table 3. Comparison of Post-Test Prenatal Health Behavior Scores (N = 120)

Group	n	Mean	SD	t	df	p-value
Intervention	60	82.15	8.23			
Control	60	71.40	7.95	6.87	118	<0.001

Source: Primary survey data processed by the authors, 2025

Women who participated in obstetric care education achieved significantly higher prenatal health behavior scores than those in the control group. The difference of 10.75 points between group means demonstrates meaningful behavioral improvement attributable to the intervention. The intervention group reported greater compliance with antenatal appointments, more consistent nutritional practices, increased participation in safe physical activities, and stronger avoidance of harmful behaviors. Statistical analysis confirmed that these differences were highly significant (p < 0.001). The effect size analysis produced Cohen's d = 1.33, indicating a large practical effect. This result suggests that the intervention not only generated statistically significant improvements but also produced clinically meaningful behavioral changes.

Behavioral Changes Across Time

To assess behavioral sustainability, prenatal health behavior scores were analyzed across three observation periods.

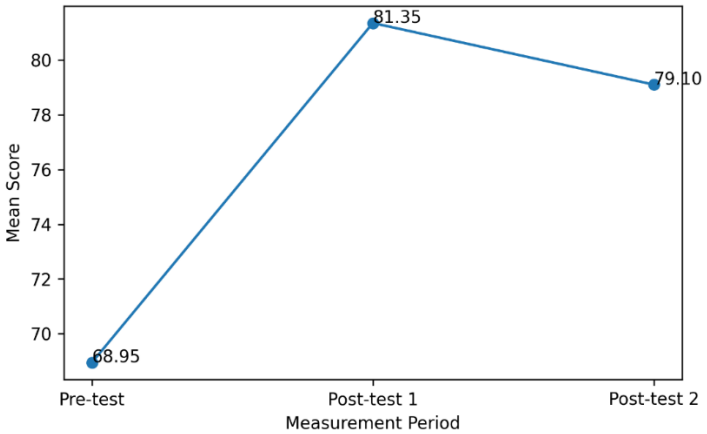

Figure 1. Mean Prenatal Health Behavior Scores Across Three Measurement Periods

Source: Primary survey data processed by the authors, 2025

The repeated-measures ANOVA demonstrated significant changes in prenatal health behavior scores across the three measurement periods, with Wilks' Lambda = 0.312, $F(2,58) = 64.75$, $p < 0.001$, and a large effect size ($\eta^2 = 0.69$). As illustrated in Figure 1, the mean behavior score increased substantially from baseline (M = 68.95) to the immediate post-intervention assessment (M = 81.35), representing an improvement of 12.40 points. At the four-week follow-up assessment, the mean score decreased slightly to 79.10, corresponding to a reduction of 2.25 points relative to Post-test 1. Despite this modest decline, the follow-up score remained considerably higher than the baseline level, indicating sustained behavioral improvement after the intervention. The large effect size suggests that approximately 69% of the variance in prenatal health behavior scores across time can be attributed to the educational intervention. Overall, these findings provide strong evidence that obstetric care education generated both immediate and sustained positive changes in prenatal health behaviors among pregnant women.

Behavioral Improvements by Indicator

To better understand the specific behavioral dimensions affected by the intervention, individual indicators were examined.

Table 4. Improvements in Prenatal Health Behavior Indicators

Indicator	Pre-test Mean	Post-test Mean	Improvement (%)
Antenatal Care Attendance	3.42	4.38	28.1
Nutritional Compliance	3.21	4.29	33.6
Safe Physical Activity	3.15	4.05	28.6
Avoidance of Risk Behaviors	3.76	4.55	21.0

Source: Primary survey data processed by the authors, 2025

Among the behavioral dimensions examined, nutritional compliance demonstrated the largest improvement (33.6%), followed by safe physical activity (28.6%) and antenatal care attendance (28.1%). Improvements were also observed in avoidance of harmful behaviors, although the magnitude was relatively smaller because baseline scores were already comparatively high. These findings suggest that obstetric education was particularly effective in influencing behaviors requiring active decision-making and daily self-management practices.

Predictors of Post-Intervention Prenatal Health Behaviors

The final analysis examined variables associated with post-intervention behavioral outcomes.

Table 5. Multiple Regression Analysis of Predictors of Prenatal Health Behavior

Predictor	β	SE	t	p-value
Age	0.12	0.07	1.71	0.091
Education Level	0.28	0.09	3.12	0.002
Parity	-0.10	0.06	-1.62	0.108
Knowledge Gain	0.46	0.08	5.75	<0.001

Model Statistics: $R^2 = 0.52$; Adjusted $R^2 = 0.49$; $F = 31.27$; $p < 0.001$.

Source: Primary survey data processed by the authors, 2025

The regression model explained 52% of the variance in prenatal health behavior outcomes. Knowledge gain emerged as the strongest predictor ($\beta = 0.46$, $p < 0.001$), indicating that improvements in knowledge significantly increased the likelihood of healthier prenatal behaviors.

Educational attainment also significantly influenced behavioral outcomes (β = 0.28, p = 0.002), suggesting that women with higher educational backgrounds were better able to apply health information in practice. Age and parity did not demonstrate statistically significant effects.

Obstetric Care Education as a Strategic Mechanism for Sustaining Prenatal Health Behavior Change

The findings of this study provide strong evidence that structured obstetric care education contributes significantly to improvements in maternal knowledge and prenatal health behaviors. More importantly, the results demonstrate that knowledge enhancement functions as a critical pathway through which educational interventions influence behavioral adaptation during pregnancy. This finding aligns with previous studies indicating that maternal education programs improve antenatal care utilization, nutritional practices, and self-management behaviors by strengthening health literacy and informed decision-making capacities (Dewidar et al., 2023; Grenier et al., 2021; Benedetto et al., 2024). The substantial increase in knowledge scores observed in this study supports the proposition that educational interventions remain one of the most effective non-clinical approaches for promoting maternal health outcomes.

The behavioral improvements identified in the intervention group are also consistent with earlier evidence suggesting that structured antenatal education positively influences adherence to prenatal recommendations, dietary compliance, and health-seeking behavior (Nguyen et al., 2021; Karyadi et al., 2023; Killeen et al., 2022). However, the present study extends previous research by demonstrating that obstetric care education simultaneously affects multiple dimensions of prenatal health behavior rather than isolated outcomes. While many earlier studies focused on specific behaviors such as iron supplementation adherence, breastfeeding preparation, or antenatal attendance, this research provides a more comprehensive assessment encompassing nutrition, physical activity, healthcare utilization, and avoidance of harmful practices. This integrated perspective constitutes an important contribution to the maternal health literature and represents a key novelty of the study.

Another notable finding concerns the sustainability of behavioral change. Although a slight decline in behavioral scores was observed during the follow-up period, improvements remained significantly higher than baseline levels. This pattern is consistent with the behavior change literature, which suggests that educational interventions often produce immediate gains that may diminish without reinforcement, yet still generate meaningful long-term benefits (Rockliffe et al., 2021; Herzog-Petropaki et al., 2022). The sustained effects observed in this study indicate that structured obstetric education can facilitate durable behavioral adaptation, particularly when educational content is practical, accessible, and directly relevant to maternal needs.

The regression analysis further revealed that knowledge gain and educational attainment were significant predictors of post-intervention prenatal health behaviors. This finding supports health literacy and Health Belief Model perspectives, which argue that individuals are more likely to engage in preventive health behaviors when they possess adequate knowledge and the capacity to interpret health information effectively (Pope et al., 2022; Francis et al., 2021). The absence of significant effects for age and parity suggests that educational interventions may be broadly effective across different maternal demographic groups, highlighting their potential applicability within diverse antenatal populations.

From a theoretical perspective, this study contributes to the growing body of evidence linking health literacy development with behavioral change in maternal healthcare

settings. The findings strengthen existing behavioral theories by demonstrating that knowledge acquisition serves not merely as an outcome of education but as a mechanism that facilitates sustained behavioral transformation. Practically, the results support the integration of structured educational programs into routine antenatal care services. Healthcare managers and policymakers should consider institutionalizing obstetric care education as a standard component of maternal healthcare delivery, given its relatively low cost and substantial behavioral benefits.

This study has several implications. First, healthcare systems should promote ongoing educational activities during pregnancy instead of providing onetime counselling. Second, maternal health programs need to integrate into their approach behaviorally oriented educational strategies that vary based on literacy levels. Third, increasing the education skills of midwives and nurses could increase the effectiveness of interventions and improve birth outcomes.

A few drawbacks must be noted. The quasi-experimental design has fewer capacities than randomized controlled trials in making full causal inference. Furthermore, the study duration was fairly brief and could not measure long-term behavioral maintenance during pregnancy and the postpartum period. Longitudinal and multicenter designs should be used in the future, and more diverse populations should be included, as well as the effectiveness of digital and hybrid education intervention. Additionally, there is a need for further investigation of mediating and moderating factors, such as social support, cultural beliefs and health care accessibility, which can help elucidate the processes by which obstetric education influences maternal behavior. In total, they will contribute to the evidence base of effective and sustainable maternal health education programs.

CONCLUSION

This study demonstrates that obstetric care education plays a significant role in improving maternal knowledge and promoting healthier prenatal behaviors among pregnant women. The findings indicate that women who participated in the educational intervention exhibited higher levels of prenatal health literacy, better adherence to antenatal care recommendations, improved nutritional practices, greater engagement in safe physical activities, and stronger avoidance of harmful behaviors. Furthermore, knowledge gain emerged as the strongest predictor of behavioral improvement, highlighting the critical role of health education in facilitating positive maternal health outcomes.

Theoretically, this study contributes to maternal health and health literacy literature by providing evidence that knowledge acquisition serves as a key mechanism linking educational interventions to sustained behavioral change. Practically, the findings support the integration of structured obstetric education into routine antenatal care services as a cost-effective strategy for improving maternal healthcare quality. Nevertheless, the study is limited by its quasi-experimental design and relatively short follow-up period. Future research should employ longitudinal and multicenter approaches to examine long-term behavioral sustainability and explore the influence of contextual factors such as social support, cultural beliefs, and digital health interventions.

REFERENCES

Ahmed, A. M., Grandi, S. M., Pullenayegum, E., McDonald, S. D., Beltempo, M., Premji, S. S., ... & Pechlivanoglou, P. (2024). Short-term and long-term mortality risk after preterm birth. *JAMA network open*, *7*(11), e2445871. https://doi.org/10.1001/jamanetworkopen.2024.45871

Aidoo, E. M. (2025). Advancing precision medicine and health education for chronic disease prevention in vulnerable maternal and child populations. *World*

Journal of Advanced Research and Reviews, *25*(2), 2355-76. https://doi.org/10.30574/wjarr.2025.25.2.0623

Aidoo, E. M. (2025). Advancing precision medicine and health education for chronic disease prevention in vulnerable maternal and child populations. *World Journal of Advanced Research and Reviews*, *25*(2), 2355-76. https://doi.org/10.30574/wjarr.2025.25.2.0623

Bas-Sarmiento, P., Lamas-Toranzo, M. J., Fernández-Gutiérrez, M., & Poza-Méndez, M. (2022). Health literacy, misinformation, self-perceived risk and fear, and preventive measures related to COVID-19 in Spanish university students. *International Journal of Environmental Research and Public Health*, *19*(22), 15370. https://doi.org/10.3390/ijerph192215370

Beressa, G., Whiting, S. J., & Belachew, T. (2025). Effect of nutrition education integrating the health belief model and theory of planned behavior during pregnancy on gestational weight gain and birth weight in Southeast Ethiopia using complex analyses. *BMC pregnancy and childbirth*, *25*(1), 196. https://doi.org/10.1186/s12884-025-07284-x

Dally, D., Amith, M., Mauldin, R. L., Thomas, L., Dang, Y., & Tao, C. (2024). A semantic approach to describe social and economic characteristics that impact health outcomes (social determinants of health): ontology development study. *Online Journal of Public Health Informatics*, *16*, e52845. https://doi.org/10.2196/52845

Francis, E. C., Zhang, L., Witrick, B., & Chen, L. (2021). Health behaviors of American pregnant women: A cross-sectional analysis of NHANES 2007–2014. *Journal of Public Health*, *43*(1), 131-138. https://doi.org/10.3390/ijms25094977

Gregory, K. D., Ramos, D. E., & Steegers-Theunissen, R. P. M. (2024). Preconception and prenatal care. *Obstetrics: Normal and Problem Pregnancies E-Book*, *86*.

Guo, Z., Chen, Y., Zhang, Y., Ding, C., Li, M., Xu, L., & Jin, J. (2023). Associations among risk perception, health efficacy, and health behaviors for cardiovascular disease: an application of risk perception attitude framework. *Frontiers in Cardiovascular Medicine*, *10*, 1201789. https://doi.org/10.3389/fcvm.2023.1201789

Herzog-Petropaki, N., Derksen, C., & Lippke, S. (2022). Health behaviors and behavior change during pregnancy: Theory-based investigation of predictors and interrelations. *Sexes*, *3*(3), 351-366. https://doi.org/10.3390/sexes3030027

Hjorth, C. F., Kjærulff, T. M., Thomsen, M. K., Cronin-Fenton, D., Dalton, S. O., & Olsen, M. H. (2025). SEPLINE: Socioeconomic Position in Epidemiological Research—A National Guideline on Danish Registry Data. *Clinical epidemiology*, 593-624. https://doi.org/10.2147/clep.s520772

Karyadi, E., Reddy, J. C., Dearden, K. A., Purwanti, T., Mardewi, Asri, E., ... & Raut, M. K. (2023). Antenatal care is associated with adherence to iron supplementation among pregnant women in selected low-middle-income-countries of Asia, Africa, and Latin America & the Caribbean regions: Insights from Demographic and Health Surveys. *Maternal & child nutrition*, *19*(2), e13477. https://doi.org/10.1111/mcn.13477

Killeen, S. L., Geraghty, A. A., O'Brien, E. C., O'Reilly, S. L., Yelverton, C. A., & McAuliffe, F. M. (2022). Addressing the gaps in nutritional care before and

during pregnancy. *Proceedings of the Nutrition Society*, *81*(1), 87-98. https://doi.org/10.1017/S0029665121003724

Kim, H. Y., Cho, G. J., Ahn, K. H., Hong, S. C., Oh, M. J., & Kim, H. J. (2024). Short-term neonatal and long-term neurodevelopmental outcome of children born term low birth weight. *Scientific Reports*, *14*(1), 2274. https://doi.org/10.1038/s41598-024-52154-9

Koruk, F., Kahraman, S., Turan, Z., Nur Özgen, H., & Beyazgül, B. (2025). The Effects of Interventions During Pregnancy to Improve Breastfeeding Self-Efficacy: Systematic Review and Meta-Analysis. *Journal of Midwifery & Women's Health*, *70*(4), 610-623. https://doi.org/10.1111/jmwh.13742

Lange, A. E., Mahlo-Nguyen, J., Pierdant, G., Allenberg, H., Heckmann, M., & Ittermann, T. (2023). Antenatal Care and Health Behavior of Pregnant Women—An Evaluation of the Survey of Neonates in Pomerania. *Children*, *10*(4), 678. https://doi.org/10.3390/children10040678

Lin, Y., Xiu, X., Lin, J., Chen, Z., Zheng, C. X., Pan, X., ... & Yan, J. (2023). Application of team-based flipped classroom and traditional learning on the antenatal education center course. *Advances in medical education and practice*, 1379-1390. https://doi.org/10.2147/amep.s429806

Liu, F., & Panagiotakos, D. (2022). Real-world data: a brief review of the methods, applications, challenges and opportunities. *BMC Medical Research Methodology*, *22*(1), 287. https://doi.org/10.1186/s12874-022-01768-6

Luo, W. (2025). An empirical study of integration models and mechanisms for maternity care in innovative vocational education. *Scientific Reports*. https://doi.org/10.1038/s41598-025-31951-w

Mate, A., Reyes-Goya, C., Santana-Garrido, Á., & Vázquez, C. M. (2021). Lifestyle, maternal nutrition and healthy pregnancy. *Current vascular pharmacology*, *19*(2), 132-140. https://doi.org/10.2147/PPA.S299294

Nguyen, L. D., Nguyen, L. H., Ninh, L. T., Nguyen, H. T. T., Nguyen, A. D., Vu, L. G., ... & Ho, R. C. (2022). Women's holistic self-care behaviors during pregnancy and associations with psychological well-being: implications for maternal care facilities. *BMC pregnancy and childbirth*, *22*(1), 631. https://doi.org/10.1186/s12884-022-04961-z

Nguyen, P. H., Kachwaha, S., Tran, L. M., Avula, R., Young, M. F., Ghosh, S., ... & Menon, P. (2021). Strengthening nutrition interventions in antenatal care services affects dietary intake, micronutrient intake, gestational weight gain, and breastfeeding in Uttar Pradesh, India: results of a cluster-randomized program evaluation. *The Journal of Nutrition*, *151*(8), 2282-2295. https://doi.org/10.1093/jn/nxab131

Noptriani, S., & Simbolon, D. (2022). Probability of non-compliance to the consumption of Iron Tablets in pregnant women in Indonesia. *Journal of preventive medicine and hygiene*, *63*(3), E456. https://doi.org/10.15167/2421-4248/jpmh2022.63.3.2340

Obeagu, E. I., & Alsadi, R. A. (2025). From Diagnosis to Acceptance: Mental Health Trajectories in HIV-Infected Patients. *Universal Journal of Pharmaceutical Research*.

Odchigue, G. (2025). Knowledge, Attitude, and Nutritional Intervention on the Quality of Antenatal Care Among Pregnant Women. *Journal of*

Interdisciplinary Perspectives, *3*(5), 263-273. https://doi.org/10.69569/jip.2025.131

Pope, J., Olander, E. K., Leitao, S., Meaney, S., & Matvienko-Sikar, K. (2022). Prenatal stress, health, and health behaviours during the COVID-19 pandemic: An international survey. *Women and Birth*, *35*(3), 272-279. https://doi.org/10.1016/j.wombi.2021.03.007

Rasmussen, T. D., Andersen, A. M. N., Ekstrøm, C. T., Jervelund, S. S., & Villadsen, S. F. (2023). Improving health literacy responsiveness to reduce ethnic and social disparity in stillbirth and infant health: a cluster randomized controlled effectiveness trial of the MAMAACT intervention. *International Journal of Nursing Studies*, *144*, 104505. https://doi.org/10.1016/j.ijnurstu.2023.104505

Rezaei, Z., Yazdanpanahi, Z., Asadollahi, A., Karimi, M., & Ghahremani, L. (2025). Evaluating the impact of an educational self-care intervention on the empowerment of primigravida pregnant women covered by family medicine program in the Estahban City—an application of the pender's health promotion model. *BMC Pregnancy and Childbirth*, *25*(1), 308. https://doi.org/10.1186/s12884-025-07437-y

Rockliffe, L., Peters, S., Heazell, A. E., & Smith, D. M. (2021). Factors influencing health behaviour change during pregnancy: a systematic review and meta-synthesis. *Health psychology review*, *15*(4), 613-632. https://doi.org/10.1080/17437199.2021.1938632

Romero-Barranca, J., Garcia-Cabrera, E., Román, E., Quintero-Flórez, A., Luque-Romero, L. G., & Vilches-Arenas, Á. (2024). Influential social determinants of adherence to preventive and health promotion activities during pregnancy and the first year of life: systematic review. *Children*, *11*(3), 331. https://doi.org/10.3390/children11030331

Sabetghadam, S., Keramat, A., Goli, S., Malary, M., & Rezaie Chamani, S. (2023). Maternal health literacy, health information-seeking behavior and pregnancy outcomes among Iranian pregnant women: A cross-sectional study. *Community Health Equity Research & Policy*, *44*(1), 77-87. https://doi.org/10.1177/0272684x221095659

Sanas, N. T., & Resky, S. D. (2025). Interactive nutrition education for pregnant women: Strengthening maternal health and environmental sustainability in stunting prevention. *EcoVision: Journal of Environmental Solutions*, *2*(2), 117-135. https://doi.org/10.61511/evojes.v2i2.2025.2235

Shutsko, A. (2022). Country-specific digital inequalities in older people's online health information seeking in Europe: impact of socio-demographic and socio-economic factors. *Journal of Information Science Theory and Practice*, *10*(4), 38-52. https://doi.org/10.1633/JISTaP.2022.10.4.4

Souza, J. P., Day, L. T., Rezende-Gomes, A. C., Zhang, J., Mori, R., Baguiya, A., ... & Oladapo, O. T. (2024). A global analysis of the determinants of maternal health and transitions in maternal mortality. *The Lancet Global Health*, *12*(2), e306-e316. https://doi.org/10.1016/s2214-109x(23)00468-0

Super, S., Beulen, Y. H., Koelen, M. A., & Wagemakers, A. (2021). Opportunities for dietitians to promote a healthy dietary intake in pregnant women with a low socio-economic status within antenatal care practices in the Netherlands: a qualitative study. *Journal of Health, Population and Nutrition*, *40*(1), 35. https://doi.org/10.1186/s41043-021-00260-z

Wang, X., Shi, J., & Lee, K. M. (2022). The digital divide and seeking health information on smartphones in Asia: Survey study of ten countries. *Journal of Medical Internet Research*, *24*(1), e24086. https://doi.org/10.2196/24086

Wang, Y. W., & Chang, Y. J. (2023). Effects of the experience of breastfeeding-friendly practices and breastfeeding intention and self-efficacy on breastfeeding behavior: a cohort study in Taiwan. *International Breastfeeding Journal*, *18*(1), 5. https://doi.org/10.1186/s13006-022-00539-9

Wen, G., Zhai, J., Wen, P., Yang, F., & Xie, X. (2025). Impact of antepartum case-based learning on glycemic control and self-management skills in women with gestational diabetes: A patient-centered non-parallel quasi-experimental study. *Patient preference and adherence*, 451-462.

Yuhas, M., Moore, C. F., Garay, J., & Brown, S. D. (2022). Improving maternal cardiovascular health in underserved populations: a narrative review of behavioral intervention trials targeting postpartum weight retention. *Current atherosclerosis reports*, *24*(9), 689-699. https://doi.org/10.1007/s11883-022-01045-3