Republic of Yemen
Ministry of Education and Scientific Research
21 September University of Medical and Applied Sciences

كلية التمريض العالي
Faculty of Higher Nursing

Assessment for Threats of Medication Use and Their Impact on Pregnant Women at Al-Sabeen and Kuwait Hospitals in Sana'a City, Yemen

A Research Project Submitted to the Faculty of Higher Nursing, 21 September University, in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Nursing

Researchers

Fairoz Ahmed Yahia Bader
Rehab Abdullah Abdullah Qalalah
Waleed Khaled Hussein Ghabash
Nada Hamed Asaad Abdu
Asrar Hamed Asaad Abdu Hasen
Hames Muhammed Ahmed Belalah
Adenan Abdo Alsalam Bajash Salman
Rasha Muhammed Ahmed Farea
Shaima Ali Saad Al-Bahloli
Adel Mohsen Muhammad Al-Jamali
Adel Shouqi Shouqi Abdu
Khadeejah Abdullwahed Saif
Abdullah Ezi Muhammad Al-Muntaser
Nada Mahdi Al-Sarh
Ahmad Sinan Muhammad Zahim
Rushdi Shawqi Abdullah Atiya

Supervisors

Dr. Houria Al-Sabri

Ass. Prof. Community Medicine

AD 2026 - AH 1447

Acknowledgments

We extend our deepest gratitude and appreciation to ***Professor Dr. Mujahid Ma'asar***, President of the University, and to ***Professor Dr. Abdulhamid Al-Dhaifani***, Dean of the College of Nursing, for their unwavering support and constant interest in our success, and for illuminating our academic journey with their guidance and encouragement. We also express our sincere appreciation to our supervisor, ***Dr. Houria Al-Sabri***, for her continuous and meticulous academic supervision, valuable guidance, and constructive feedback, which greatly contributed to presenting this research in its finest form.

We also express our gratitude to all the academic and administrative staff whose words and guidance served as a beacon for us on our scientific path. Special thanks to ***Professor Dr. Munir Al-Wasabi***, whose valuable guidance and continuous support were instrumental in the completion of this research. We offer our sincere thanks to all members of the judging committee, each named and titled, for their cooperation and kind support throughout the preparation of this research.

Our heartfelt thanks extend to our beloved families, our parents and relatives, who surrounded us with love, patience, and support, and were our safe haven throughout this journey. We ask God Almighty to reward everyone abundantly, to place their efforts on the scales of their good deeds, and to grant this work acceptance and benefit.

Dedication

We dedicate this work to our beloved parents, whose endless love, prayers, and sacrifices have been the foundation of our success.

To our families, for their continuous support, patience, and encouragement throughout our academic journey.

To everyone who stood by us, believed in us, and inspired us to achieve our goals.

And finally, to all those who seek knowledge and strive to make a difference in the field of nursing.

Abstract

Background: Medication use during pregnancy is common but may pose risks to maternal and fetal health. Understanding these risks and influencing factors is essential for improving outcomes.

Objective: This study aimed to assess the threats for medication use and their impact on pregnant women at Al-Sabeen and Kuwait Hospitals in Sana'a City, Yemen, and to evaluate associated factors and awareness.

Methods: A cross-sectional study was conducted among 700 pregnant women. Data were collected using a structured questionnaire covering socio-demographic characteristics, obstetric history, pregnancy-related threats, medication use, and awareness. Descriptive statistics, chi-square tests, and binary logistic regression analysis were performed to identify factors associated with medication use.

Results: Medication use during pregnancy was high (78.1%) and was significantly associated with socio-demographic and obstetric factors ($p < 0.05$). Significant associations were also found with several pregnancy-related threats, including preeclampsia, gestational diabetes, high blood pressure, infection, and fetal growth restriction. Logistic regression identified high blood pressure, infection, and occupation as independent predictors of medication use. Most medications were physician-prescribed, and the majority of participants consulted a doctor; however, awareness of the risks of herbs and supplements was moderate.

Conclusions: Medication use during pregnancy was highly prevalent and associated with clinical and socio-demographic factors. High blood pressure and infection were the strongest predictors, highlighting the need to improve awareness and safe practices.

Keywords: Medication Use, Pregnancy, Maternal Health, Pregnancy Complications, Awareness, Yemen

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List of Abbreviations

Abbreviation	*Definition*
21UMAS	21 September University of Medical and Applied Sciences
ADHD	Attention-Deficit/Hyperactivity Disorder
ANC	Antenatal Care
ASD	Autism Spectrum Disorder
ASMs	Anti-Seizure Medications
CI	Confidence Interval
COVID-19	Coronavirus Disease 2019
FDA	Food and Drug Administration
GDM	Gestational Diabetes Mellitus
H_0	Null Hypothesis
H_1	Alternative Hypothesis
HIV	Human Immunodeficiency Virus
NICU	Neonatal Intensive Care Unit
NSAIDs	Nonsteroidal Anti-Inflammatory Drugs
NVP	Nausea and Vomiting in Pregnancy
OR	Odds Ratio
PPHN	Persistent Pulmonary Hypertension of the Newborn
SPSS	Statistical Package for the Social Sciences
SSRIs	Selective Serotonin Reuptake Inhibitors
SNRIs	Serotonin-Norepinephrine Reuptake Inhibitors

Chapter I: Introduction

1.1 Background

Medication use during pregnancy refers to the use of prescribed, over-the-counter, or self-administered drugs by pregnant women for the prevention, treatment, or control of health conditions. Pregnancy is a unique physiological state in which changes in drug absorption, distribution, metabolism, and excretion may alter the safety and effectiveness of medications, making rational drug use especially important during this period **(Sullivan *et al.*, 2026; Wesley *et al.*, 2021)**.

Globally, medication use during pregnancy is a major maternal health concern, as many drugs can cross the placenta and may affect fetal development. Exposure to medications during pregnancy has been associated with adverse outcomes such as congenital anomalies, miscarriage, preterm birth, and fetal growth restriction **(Sullivan *et al.*, 2026)**. Recent large-scale studies indicate that the majority of pregnant women are exposed to at least one medication, highlighting the widespread nature of this issue **(Hwang *et al.*, 2024)**. However, safety data remain limited for many medications because pregnant women are often excluded from clinical trials **(Wesley *et al.*, 2021)**.

Recent evidence also suggests that medication exposure during pregnancy is associated with a range of pregnancy and neonatal complications, depending on the type and duration of use, including low birth weight, preterm birth, and neonatal complications **(Ryan *et al.*, 2023)**. Additionally, systematic reviews have identified associations between certain medications and congenital anomalies, emphasizing the need for careful risk–benefit assessment **(Baldacci *et al.*, 2024)**.

Regionally, studies in developing and middle-income countries indicate that medication use during pregnancy is common, with variability in prevalence due to differences in healthcare access and prescribing practices. Self-medication remains a significant concern, particularly in settings where access to healthcare is limited and the regulation of drug use is weak **(Sullivan *et al.*, 2026)**.

Locally, in low-resource settings such as Yemen, medication use during pregnancy is further complicated by limited access to healthcare services, weak pharmacovigilance systems, and increased reliance on self-medication and informal advice. The aim of this study is to assess the threats posed by medication use and their impact on pregnant women at Al-Sabeen and Kuwait Hospitals in Sana'a City, Yemen, and to evaluate the associated factors and awareness-related practices.

1.2 Problem Statement

Medication use during pregnancy is often necessary but may pose risks to both the mother and fetus, especially when used inappropriately or without medical supervision. In Sana'a City, limited awareness, easy access to medications, and healthcare challenges may increase these risks among pregnant women. There is a lack of data on medication use patterns and their effects in Al-Sabeen and Kuwait Hospitals. Therefore, this study aims to assess the potential threats for medication use and their impact on pregnant women in these settings.

1.3 Justifications

- High prevalence of medication use during pregnancy with potential health risks
- Limited awareness and regulation of drug use among pregnant women in Yemen
- Need to improve safe prescribing practices and patient education
- Contribution to better maternal and fetal health outcomes.

1.4 Research Questions

1. What are the common types of medications used by pregnant women at Al-Sabeen and Kuwait Hospitals?

2. What are the potential risks and impacts of medication use on pregnant women and their fetuses?
3. What is the level of awareness among pregnant women regarding safe medication use?

1.5 Hypothesis

Null Hypothesis (H_0): There is no significant relationship between medication use during pregnancy and maternal or fetal health outcomes among women attending Al-Sabeen and Kuwait Hospitals.

Alternative Hypothesis (H_1): There is a significant relationship between medication use during pregnancy and maternal or fetal health outcomes among women attending Al-Sabeen and Kuwait Hospitals.

1.6 Objectives

1.6.1 General Study Objective

To assess the threats for medication use and their impact on pregnant women attending Al-Sabeen and Kuwait Hospitals in Sana'a City, Yemen.

1.6.2 Specific Study Objectives

- To identify the common types of medications used by pregnant women at Al-Sabeen and Kuwait Hospitals
- To assess the level of awareness among pregnant women regarding safe medication use.
- To determine the potential risks associated with medication use during pregnancy.
- To evaluate the impact of medication use on maternal and fetal health outcomes.
- To examine factors influencing medication use among pregnant women.

Chapter II: Literature Review

2.1 Introduction

Medication use during pregnancy is nearly universal, with recent studies indicating that over 90% of pregnant women take at least one medication during gestation, and the average number of medications per pregnancy ranges from 2 to 4 in high-income countries **(Alwan and Grant, 2024; Sillis *et al.*, 2026; Ezenwaeze *et al.*, 2025)**. This high prevalence reflects the necessity of pharmacological management for both chronic and pregnancy-related conditions, such as epilepsy, hypertension, diabetes, infections, and mental health disorders. However, the safety of most medications during pregnancy remains inadequately studied, largely due to the historical exclusion of pregnant women from clinical trials following the thalidomide tragedy of the 1960s **(WHO, 2024; Guglielmi, 2026; Alexe *et al.*, 2025)**. As a result, clinicians and patients often face uncertainty regarding the risks and benefits of medication use in pregnancy, particularly concerning teratogenicity, fetal development, and maternal health complications.

2.2 Overview of Medication Use During Pregnancy (2019-2026)

2.2.1 Prevalence and Patterns

Recent pharmacoepidemiologic studies and registry data confirm that medication use during pregnancy is pervasive across diverse populations. In Belgium, the BELpREG registry reported that 85.8% of pregnant women used at least one medication in the first trimester, rising to 94.9% in the third trimester **(Sillis *et al.*, 2026)**. Similar high prevalence rates have been observed in the United States, United Kingdom, and other European countries, with paracetamol (acetaminophen), antiemetics, and supplements (notably folic acid) being the most frequently used agents **(Mansour *et al.*, 2024; Alwan and Grant, 2024; Ezenwaeze *et al.*, 2025)**.

The types and frequency of medication use vary by region, healthcare system, and population characteristics. Analgesics, antiemetics, antibiotics,

antihypertensives, antiepileptics, antidepressants, and vaccines (e.g., influenza, pertussis, COVID-19) are among the most commonly reported classes **(Coppola *et al.*, 2022; Alwan and Grant, 2024; Sillis *et al.*, 2026)**. Over-the-counter (OTC) medications and dietary supplements also contribute significantly to overall exposure, often without direct physician oversight **(SteelFisher *et al.*, 2020)**.

2.2.2 Drivers of Medication Use

The increasing maternal age at first pregnancy, higher prevalence of chronic conditions, and improved access to healthcare have contributed to rising medication use during pregnancy **(Winterfeld *et al.*, 2025; Alwan and Grant, 2024)**. Additionally, the COVID-19 pandemic has influenced patterns of medication and vaccine uptake, with studies demonstrating the safety and benefits of COVID-19 vaccination during pregnancy for both maternal and neonatal outcomes **(Alexe *et al.*, 2025)**.

Despite the necessity of pharmacotherapy for many conditions, concerns about fetal safety, lack of definitive data, and risk-averse labeling practices often lead to discontinuation or avoidance of essential medications, sometimes resulting in adverse maternal or fetal outcomes **(Boone *et al.*, 2025; Winterfeld *et al.*, 2025; Guglielmi, 2026)**.

2.3 Types of Medications Commonly Used in Pregnancy

2.3.1 Analgesics

Paracetamol (Acetaminophen): Paracetamol is the most widely used analgesic during pregnancy, with prevalence rates exceeding 35% in the first trimester in several cohorts **(Sillis *et al.*, 2026; Ezenwaeze *et al.*, 2025)**. Use is typically short-term, but concerns have been raised about potential associations with neurodevelopmental outcomes, such as attention-deficit/hyperactivity disorder (ADHD) and autism spectrum disorder (ASD), though evidence remains

inconclusive and confounded by indication and exposure heterogeneity **(Sundbakk *et al.*, 2022; Sillis *et al.*, 2026)**.

Nonsteroidal Anti-Inflammatory Drugs (NSAIDs): NSAID use declines with advancing gestation, reflecting awareness of risks such as premature closure of the fetal ductus arteriosus and oligohydramnios, particularly after 20 weeks of gestation **(FDA, 2020; Dathe *et al.*, 2018)**. Ibuprofen is the most commonly used NSAID, but its use is generally avoided in the third trimester.

2.3.2 Antiemetics

Doxylamine-Pyridoxine: This combination is the first-line pharmacological treatment for nausea and vomiting in pregnancy (NVP) and is used by over a quarter of pregnant women in some European cohorts **(Ngo *et al.*, 2023; Sillis *et al.*, 2026)**. Other antiemetics, including metoclopramide and ondansetron, are commonly prescribed during pregnancy. However, concerns have been raised about the safety of ondansetron, particularly its potential association with an increased risk of oral clefts, which has led to ongoing research and regulatory evaluation **(Huybrechts *et al.*, 2018)**.

2.3.3 Antidepressants and Psychotropics

Selective Serotonin Reuptake Inhibitors (SSRIs) and Serotonin-Norepinephrine Reuptake Inhibitors (SNRIs): Antidepressant use during pregnancy is reported in 2-5% of pregnancies, with SSRIs (e.g., sertraline, citalopram, fluoxetine) being the most common **(Bao *et al.*, 2025; Liu *et al.*, 2025; Boone *et al.*, 2025)**. Use typically declines during pregnancy due to safety concerns, but untreated maternal depression poses significant risks to both mother and child **(Liu *et al.*, 2025; Boone *et al.*, 2025)**.

Antipsychotics and Mood Stabilizers: Use of antipsychotics and mood stabilizers (e.g., lithium, valproic acid, lamotrigine) is less common but critical for women with severe psychiatric disorders or epilepsy. The teratogenic risks of certain

mood stabilizers, particularly valproic acid, are well established. Valproic acid has been identified as a significant human teratogen associated with major congenital anomalies and neurodevelopmental disorders **(Ornoy, 2009; Moore *et al.*, 2025; Gómez-Ramiro *et al.*, 2019; Corradetti *et al.*, 2026)**.

2.3.4 Antiepileptics (Anti-Seizure Medications, ASMs)

Valproic Acid, Carbamazepine, Lamotrigine, Levetiracetam, Topiramate, Gabapentinoids: ASMs are prescribed for epilepsy, bipolar disorder, and neuropathic pain. Valproic acid and topiramate are associated with high teratogenic risk, while lamotrigine and levetiracetam are considered safer alternatives **(Ornoy, 2009; Moore *et al.*, 2025; Gómez-Ramiro *et al.*, 2019; Corradetti *et al.*, 2026)**.

2.3.5 Antihypertensives and Cardiovascular Agents

Beta-Blockers, Methyldopa, Labetalol, Low-Dose Aspirin: Hypertensive disorders of pregnancy are managed with agents such as labetalol and methyldopa. Low-dose aspirin is increasingly used for preeclampsia prevention, with rising prevalence in later trimesters **(Coppola *et al.*, 2022; Sillis *et al.*, 2026)**.

2.3.6 Endocrine and Metabolic Agents

Insulin remains the standard therapy for the management of diabetes during pregnancy, as it does not cross the placenta and is considered safe for the fetus. Oral agents such as metformin may be used in selected cases, including women with polycystic ovary syndrome (PCOS), although their use remains more limited **(Ornoy *et al.*, 2015)**. Thyroid hormone replacement is common, reflecting the prevalence of hypothyroidism in pregnancy.

2.3.7 Anti-Infectives and Vaccines

Antibiotics, Antivirals, Vaccines: Antibiotics are prescribed for urinary tract and other infections, with penicillins and cephalosporins preferred for safety. Antiretroviral therapy is essential for HIV-positive pregnant women, with robust data supporting safety for many agents **(Alexe *et al.*, 2025)**. Vaccine uptake

(influenza, pertussis, COVID-19) is substantial but not universal **(Sillis *et al.*, 2026; Ezenwaeze *et al.*, 2025)**.

2.4 Teratogenic Medications and Congenital Malformations: Recent Evidence

2.4.1 Teratogenicity: Definitions and Mechanisms

A teratogen is an agent that can cause permanent structural or functional abnormalities in the developing embryo or fetus when exposure occurs during critical developmental periods **(Tan *et al.*, 2025)**. Teratogenic risk is influenced by the timing, dose, and duration of exposure, as well as genetic and environmental modifiers.

2.4.2 High-Risk Medications

Valproic Acid: Valproic acid is associated with a markedly increased risk of major congenital malformations, particularly neural tube defects, cardiac anomalies, and neurodevelopmental disorders such as ASD **(Ornoy, 2009; Moore *et al.*, 2025; Gómez-Ramiro *et al.*, 2019; Corradetti *et al.*, 2026)**. Recent population-based studies confirm that valproic acid exposure during pregnancy nearly doubles the risk of pregnancy loss and congenital conditions, and increases the risk of developmental concerns in offspring **(Ornoy, 2009; Moore *et al.*, 2025; Corradetti *et al.*, 2026)**.

Topiramate: Topiramate has been linked to fetal growth restriction, oral clefts, and neurodevelopmental disorders, prompting regulatory restrictions on its use in pregnancy **(Moore *et al.*, 2025; Gómez-Ramiro *et al.*, 2019)**.

Carbamazepine: Carbamazepine is associated with an increased risk of spina bifida and other malformations, though the risk is lower than with valproic acid **(Ornoy, 2009; Gómez-Ramiro *et al.*, 2019)**.

Lithium: Lithium exposure in the first trimester is associated with an increased risk of cardiac malformations, particularly Ebstein's anomaly, though absolute risk remains low **(Ornoy, 2009)**.

ACE Inhibitors, Angiotensin II Receptor Blockers: These agents are contraindicated in pregnancy due to risks of fetal renal dysgenesis, oligohydramnios, and skull ossification defects **(FDA, 2020; Dathe *et al.*, 2018)**.

Methotrexate, Isotretinoin, and Warfarin: These agents are well-established teratogens and are contraindicated in pregnancy **(Ornoy, 2003)**.

2.4.3 Dose-Response and Timing

The risk of teratogenicity is highest during organogenesis (weeks 3-8 post-conception), with later exposures more likely to affect growth and functional development **(Tan *et al.*, 2025; Ornoy, 2009)**. Dose-dependent teratology has been demonstrated for several agents, emphasizing the importance of using the lowest effective dose **(Ornoy, 2009)**.

2.4.4 Recent Systematic Reviews and Meta-Analyses

A 2025 systematic review and meta-analysis of antidepressant use in pregnancy found that, after adjusting for underlying depression, the increased risks of adverse outcomes (e.g., preterm birth, NICU admission) were attenuated, suggesting that much of the observed risk is attributable to the underlying psychiatric disorder rather than the medication itself **(Bao *et al.*, 2025; Liu *et al.*, 2025)**. Similar findings have been reported for SSRIs and SNRIs, though small increases in risk for specific outcomes (e.g., preterm birth, persistent pulmonary hypertension of the newborn) cannot be excluded **(Ornoy *et al.*, 2015; Liu *et al.*, 2025)**.

For antiepileptic drugs, recent large cohort studies confirm the high teratogenic risk of valproic acid and support the relative safety of lamotrigine and levetiracetam **(Ornoy, 2009; Moore *et al.*, 2025; Gómez-Ramiro *et al.*, 2019)**. Gabapentinoids (gabapentin, pregabalin) have emerged as potential concerns, with associations

observed for pregnancy loss and developmental issues, though evidence remains limited and further research is needed **(Moore *et al.*, 2025)**.

2.5 Fetal Developmental Outcomes Beyond Structural Malformations

2.5.1 Neurodevelopmental Disorders

ADHD and ASD: Several studies have investigated the association between prenatal exposure to psychotropic medications (e.g., benzodiazepines, SSRIs, valproic acid) and neurodevelopmental outcomes such as ADHD and ASD. A large Norwegian cohort study found no increased risk of childhood ADHD associated with prenatal exposure to benzodiazepines or z-hypnotics after adjusting for confounders **(Sundbakk *et al.*, 2022)**. However, valproic acid exposure is consistently associated with increased risk of ASD and cognitive impairment **(Ornoy, 2009; Moore *et al.*, 2025; Gómez-Ramiro *et al.*, 2019; Corradetti *et al.*, 2026)**.

Antidepressants: Meta-analyses suggest that the risk of ASD and ADHD is modestly increased in children exposed to antidepressants in utero, but much of this risk is attributable to confounding by indication (i.e., the underlying maternal depression) **(Ornoy, 2009; Bao *et al.*, 2025; Liu *et al.*, 2025)**.

2.5.2 Growth and Functional Outcomes

Low Birth Weight, Preterm Birth, SGA: Both untreated maternal depression and antidepressant use are associated with increased risks of preterm birth, low birth weight, and small for gestational age (SGA) infants, though the magnitude of risk is higher for untreated depression **(Bao *et al.*, 2025; Liu *et al.*, 2025)**.

Fetal Renal Dysfunction and Oligohydramnios: NSAID use after 20 weeks of gestation is associated with fetal renal dysfunction, oligohydramnios, and, in some cases, neonatal renal impairment **(FDA, 2020; Dathe *et al.*, 2018)**.

Late-pregnancy exposure to SSRIs has been associated with a modest increase in the risk of persistent pulmonary hypertension of the newborn (PPHN); however, the absolute risk remains low, and the condition is rare in the general population **(Crossen and Hernandez, 2026; Bérard *et al.*, 2017)**.

2.6 Maternal Health Complications from Medication Use

2.6.1 Direct Medication-Related Risks

NSAIDs: Use of NSAIDs in late pregnancy increases the risk of premature closure of the fetal ductus arteriosus and oligohydramnios, as well as maternal risks such as gastrointestinal bleeding, hypertension, and renal impairment **(FDA, 2020; Dathe *et al.*, 2018)**.

Antihypertensives: ACE inhibitors and angiotensin II receptor blockers are associated with maternal and fetal complications and are contraindicated in pregnancy **(FDA, 2020; Dathe *et al.*, 2018)**.

Antidepressants: Antidepressant use is associated with increased risk of gestational diabetes, preeclampsia, and postpartum hemorrhage, though these associations are confounded by underlying depression and comorbidities **(Bao *et al.*, 2025; Liu *et al.*, 2025)**.

2.6.2 Risks of Untreated Maternal Disease

Discontinuation of essential medications due to safety concerns can result in exacerbation of maternal disease, with adverse consequences for both mother and fetus. For example, uncontrolled epilepsy increases the risk of maternal and fetal morbidity and mortality, while untreated depression is associated with poor prenatal care, substance use, and adverse neurodevelopmental outcomes in offspring **(Boone *et al.*, 2025; Winterfeld *et al.*, 2025; Guglielmi, 2026)**.

2.7 Clinical Pharmacology: Pharmacokinetics and Dosing in Pregnancy

2.7.1 Physiological Changes in Pregnancy

Pregnancy induces profound physiological changes that alter drug absorption, distribution, metabolism, and excretion. Increased plasma volume, altered hepatic enzyme activity (e.g., increased CYP3A4, CYP2D6; decreased CYP1A2), enhanced renal clearance, and changes in protein binding can significantly impact drug exposure **(Coppola *et al.*, 2022; Ezenwaeze *et al.*, 2025)**.

2.7.2 Pharmacogenomics

Genetic polymorphisms in drug-metabolizing enzymes (e.g., CYP2D6, NAT2, UGTs) and transporters (e.g., P-gp, BCRP) further modulate drug response and susceptibility to adverse effects **(Ezenwaeze *et al.*, 2025)**. For example, CYP2D6 ultra-rapid metabolizers may generate high morphine concentrations from codeine, posing risks during lactation.

2.7.3 Dosing Implications

The lack of pregnancy-specific pharmacokinetic data for most medications complicates dosing decisions. Where data are available, significant changes in drug exposure have been documented (e.g., decreased lamotrigine levels, altered metoprolol exposure), necessitating dose adjustments to maintain therapeutic efficacy and minimize toxicity **(Coppola *et al.*, 2022)**. Population pharmacokinetic modeling and opportunistic sampling are increasingly used to characterize these changes and inform dosing recommendations.

2.8 Risk Communication to Pregnant Patients: Provider Practices and Patient Understanding

2.8.1 Provider Practices

Physicians, particularly obstetrician-gynecologists, frequently seek medication safety information during clinical encounters, relying on aggregated online resources (e.g., UpToDate, PDR) and mobile applications. Counseling on medication safety is most common in the first trimester and among women actively planning pregnancy, but less frequent for women of reproductive age not actively planning pregnancy, despite the high rate of unplanned pregnancies **(SteelFisher *et al.*, 2020)**.

Written materials, such as "safe lists," are widely used but may lack evidence-based rigor and completeness. There is a need for improved, high-quality written and digital resources to support patient counseling and shared decision-making **(Winterfeld *et al.*, 2025; SteelFisher *et al.*, 2020)**.

2.8.2 Patient Understanding and Risk Perception

Pregnant women often overestimate the teratogenic risks of medications, leading to unnecessary discontinuation of essential treatments and potential harm **(Boone *et al.*, 2025; Winterfeld *et al.*, 2025)**. Studies indicate that both patients and providers may lack accurate information, and that risk communication is often fragmented and inconsistent across sources.

Pharmacists play a critical role in providing medication counseling, particularly for OTC medications and minor ailments, but the impact of pharmacist-led interventions on medication use and outcomes remains to be fully elucidated **(Ngo *et al.*, 2023)**.

2.8.3 Digital Tools and Decision Aids

Digital health tools, mobile applications, and online resources (e.g., MotherToBaby, UKTIS, Embryotox, Le CRAT) are increasingly used by both patients and providers to access up-to-date information on medication safety in pregnancy **(Ngo *et al.*, 2023; Winterfeld *et al.*, 2025)**. Integrated, evidence-based platforms that serve both audiences can enhance shared decision-making, reduce misinformation, and improve adherence to essential treatments.

2.9 Interventions and Strategies for Managing Medication Risks in Pregnancy

2.9.1 Deprescribing and Medication Review

Deprescribing-systematic dose reduction or cessation of potentially inappropriate medications-is an emerging strategy to optimize pharmacotherapy in pregnancy, particularly for polypharmacy and high-risk agents **(Langford *et al.*, 2025)**. Evidence-based deprescribing guidelines and algorithms are being developed for specific drug classes, though integration into clinical practice guidelines remains variable.

2.9.2 Shared Decision-Making

Shared decision-making frameworks emphasize collaborative discussions between patients and healthcare providers, incorporating evidence-based information, patient preferences, and values **(Winterfeld *et al.*, 2025)**. Decision aids and tailored counseling can empower women to make informed choices about medication use during pregnancy.

2.9.3 Regulatory and Policy Initiatives

Regulatory agencies have implemented new labeling requirements (e.g., FDA PLLR), promoted the inclusion of pregnant women in clinical trials, and supported the development of standardized data elements and harmonized registries (e.g., ConcePTION, EFEMERIS) **(Favre *et al.*, 2024; FDA, 2024; Alexe *et al.*, 2025; Alwan and Grant, 2024)**. Ethical guidelines now recognize the imperative to include pregnant women in research to ensure equitable access to safe and effective therapies **(WHO, 2024)**.

2.10 Recent High-Impact Studies (2019-2026) on Specific Drug Classes

- Valproic Acid: Multiple studies confirm high teratogenic risk, with increased rates of neural tube defects, congenital malformations, and neurodevelopmental disorders **(Ornoy, 2009; Moore *et al.*, 2025; Gómez-Ramiro *et al.*, 2019; Corradetti *et al.*, 2026)**.
- Antidepressants: Large meta-analyses demonstrate that much of the observed risk for adverse outcomes is attributable to underlying depression rather than medication exposure, though small increases in risk for preterm birth and NICU admission persist **(Bao *et al.*, 2025; Liu *et al.*, 2025; Boone *et al.*, 2025)**.
- Gabapentinoids: Emerging evidence suggests associations with pregnancy loss and developmental concerns, warranting further investigation **(Moore *et al.*, 2025)**.
- Lamotrigine and Levetiracetam are considered among the safer antiseizure medications during pregnancy, as evidence from large cohort studies and pregnancy registries indicates that they are associated with a relatively low risk of major congenital malformations compared with other antiepileptic drugs **(Tomson *et al.*, 2018)**.
- NSAIDs: Confirmed risks of oligohydramnios, fetal renal dysfunction, and premature ductus arteriosus closure with use after 20 weeks gestation **(FDA, 2020; Dathe *et al.*, 2018)**.

2.11 Systematic Reviews and Meta-Analyses (Last 5 Years)

- Antidepressants and Depression: Comprehensive meta-analyses clarify that untreated depression poses significant risks for adverse pregnancy and child

outcomes, and that antidepressant use adds only modest additional risk for specific outcomes **(Bao *et al.*, 2025; Liu *et al.*, 2025)**.

- Antiepileptic Drugs: Systematic reviews confirm the high teratogenic risk of valproic acid and support the safety of lamotrigine and levetiracetam **(Ornoy, 2009; Moore *et al.*, 2025; Gómez-Ramiro *et al.*, 2019)**.
- Benzodiazepines and Z-Hypnotics: Large cohort studies find no increased risk of ADHD with prenatal exposure after adjusting for confounders **(Sundbakk *et al.*, 2022)**.

Chapter III: Methodology

3.1 Study Design

This study employed a descriptive cross-sectional design to assess pregnancy-related threats and patterns of medication use among pregnant women attending Al-Sabeen and Al-Kuwait Hospitals in Sana'a.

3.2 Study Setting

This study was conducted at Al-Sabeen Hospital for Maternity and Childhood and Al-Kuwait Hospital in Sana'a, Yemen. These hospitals are among the major referral centers providing maternal and antenatal healthcare services to a large number of pregnant women from different regions.

3.3 Study Duration

The study was conducted over 6 months, from September 11, 2025, to February 30, 2026.

3.4 Study Population

The study population consisted of pregnant women attending antenatal care services at Al-Sabeen Hospital for Maternity and Childhood and Al-Kuwait Hospital in Sana'a, Yemen, during the study period.

These participants were selected as they represent the target group at risk of pregnancy-related health threats and medication use. The population included women from diverse age groups, educational levels, and socioeconomic backgrounds, providing a representative sample for assessing medication use patterns and associated factors.

3.5 Sample Size and Sampling Assumptions

Sample size was calculated using Epi Info™ version 7 (CDC, USA). for cross-sectional studies, assuming a 95% confidence level, a 5% margin of error, and an expected prevalence of 50% due to the lack of reliable local data in Yemen. This

conservative estimate yields the maximum sample size. Accordingly, the minimum required sample size was 384 participants. After applying a design effect of 1.5 and adding 10% for possible non-response, the final estimated sample size was approximately 634 participants. To improve statistical power and precision, a total of **700** pregnant women were included.

This is consistent with previous studies, where sample sizes ranged from 300 to over 500 participants. For example, a study conducted in Riyadh, Saudi Arabia, included 562 pregnant women**(Almuhareb *et al.*, 2024)**, while another study included 287 participants **(Alyami *et al.*, 2023)**.

Therefore, the selected sample size is considered sufficient and appropriate to ensure reliable and generalizable findings.

3.6 Inclusion and Exclusion Criteria

3.6.1 Inclusion Criteria

- Pregnant women attending antenatal care services at Al-Sabeen and Al-Kuwait Hospitals in Sana'a during the study period.
- Women of all gestational ages.
- Women who were willing to participate in the study and provided informed consent.
- Women who were able to understand and respond to the questionnaire.

3.6.2 Exclusion Criteria

- Non-pregnant women.
- Pregnant women who were not attending antenatal care services at Al-Sabeen or Al-Kuwait Hospitals.
- Women who refused to participate or did not provide informed consent.
- Women who were unable to complete the questionnaire due to severe illness or communication difficulties.

3.7 Data Collection, Technique, and Tool

Data were collected using a structured questionnaire specifically developed for this study based on relevant literature and similar previous studies on medication use during pregnancy.

The questionnaire consisted of multiple sections, including:

- Socio-demographic characteristics
- Pregnancy-related health threats
- Medication use patterns during pregnancy
- Sources of information and level of awareness

The data collection technique involved face-to-face interviews conducted with pregnant women attending antenatal care services at Al-Sabeen and Al-Kuwait Hospitals during the study period. This method was chosen to ensure clarity in questions, enhance response accuracy, and improve response rate.

Before data collection, participants were informed about the study's purpose and provided informed consent. The confidentiality and anonymity of participants were strictly maintained throughout the study.

3.8 Pilot Study

A pilot study was conducted before the main data collection to assess the clarity, validity, and reliability of the questionnaire. The pilot study included 70 pregnant women, representing 10% of the total sample, who met the study inclusion criteria.

The purpose of the pilot study was to evaluate the comprehensibility of the questions and identify potential difficulties in the data collection procedures. Based on the feedback obtained, minor modifications were made to improve the wording and structure of the questionnaire. The questionnaire's reliability was assessed using

Cronbach's alpha, which indicated acceptable internal consistency. The data obtained from the pilot study were excluded from the final analysis.

3.9 Validity and Reliability of the Study Tool

3.9.1 Validity of the Tool

The questionnaire's validity was established through content and face validity. The tool was reviewed by a panel of experts in maternal and reproductive health to ensure that the items were relevant, clear, and appropriate for assessing medication use and pregnancy-related threats. Based on the experts' feedback, minor modifications were made to improve the clarity, wording, and structure of the questionnaire. These revisions ensured that the instrument adequately covered all domains related to medication use, pregnancy-related complications, and awareness among pregnant women. Content validity is commonly established through expert evaluation to ensure that the instrument accurately reflects the study objectives and target population **(WHO, 2016)**.

3.9.2 Reliability of the Tool

The questionnaire's reliability was assessed using Cronbach's alpha, a measure of internal consistency. The results demonstrated acceptable reliability, with a Cronbach's alpha value of 0.70, indicating that the questionnaire items were sufficiently consistent and reliable for the study.

According to previous literature, a Cronbach's alpha value of 0.70 or higher is considered acceptable for internal consistency in research studies **(Tavakol and Dennick, 2011)**.

3.10 Data Analysis

Data were entered, coded, and analyzed using the Statistical Package for Social Sciences (SPSS), version 31. Descriptive statistics were used to summarize the data, including frequencies and percentages for categorical variables.

Inferential statistical analysis was performed using the chi-square (χ^2) test to examine the association between medication use and independent variables, including socio-demographic characteristics, obstetric history, pregnancy-related threats, and awareness variables.

Furthermore, binary logistic regression analysis was conducted to identify the independent predictors of medication use during pregnancy. The strength of associations was expressed as odds ratios (ORs) with 95% confidence intervals (CIs). A p-value of less than 0.05 was considered statistically significant.

3.11 Ethical Consideration

The study adhered to ethical guidelines for research. All participants were asked to obtain written consent, and the purpose and benefits of the study were explained to them. They decided to accept the invitation to participate in the study.

All data was recorded for research only and anonymously to ensure confidentiality.

- Ethical approval will be obtained from 21UMAS University.
- The privacy and confidentiality of the data used in the research are maintained.
- Data was encrypted to ensure the patient's anonymity.

Chapter IV: Results

4.1 Socio-Demographic Characteristics

4.1.1 Distribution of Participants According to Age Group

Figure 4.1 illustrates the distribution of the study sample according to age group. The highest proportion of participants was observed among women aged 26–35 years (29.3%), followed by those aged 18–25 years and 36–44 years, each representing 26.6% of the sample. Participants aged ≥45 years constituted the lowest proportion, accounting for 17.6%.

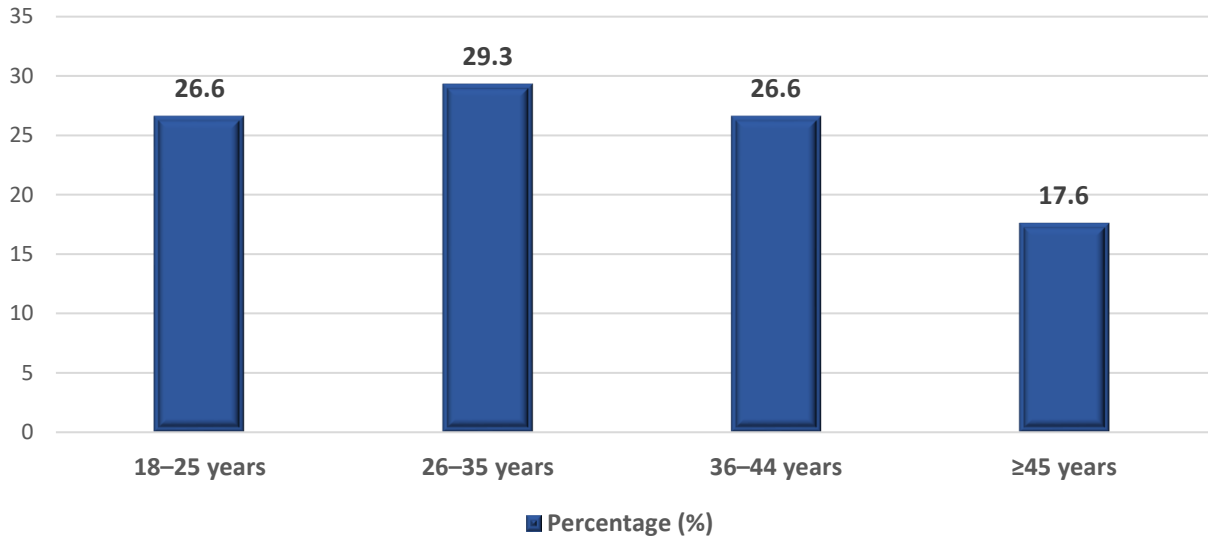

Figure 4.1: Distribution of Study Sample by Age Group (n = 700)

4.1.2 Distribution of Participants According to Marital Status

Figure 4.2 presents the distribution of the study sample according to marital status. The overwhelming majority of participants were married (89.3%), indicating that most of the study population consisted of women currently in marital relationships. In contrast, a much smaller proportion of participants were divorced (6.6%), while widowed women represented the lowest percentage (4.1%). This indicates the distribution shows a clear predominance of married participants compared to other marital status categories.

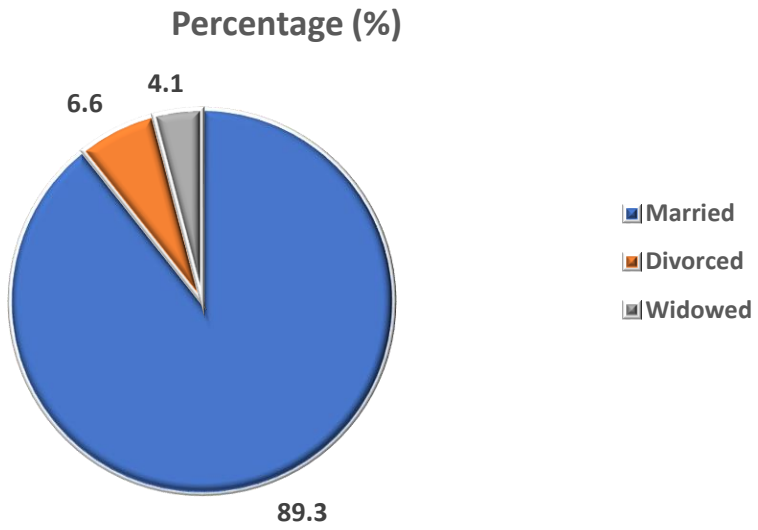

Figure 4.2: Distribution of Study Sample by Marital Status (n = 700)

4.1.3 Distribution of Participants According to Educational Level

Figure 4.3 explains that the highest proportion of participants had primary education (31.9%), followed by illiterate (25.6%) and university or higher (22.9%), while secondary education represented the lowest percentage (19.7%).

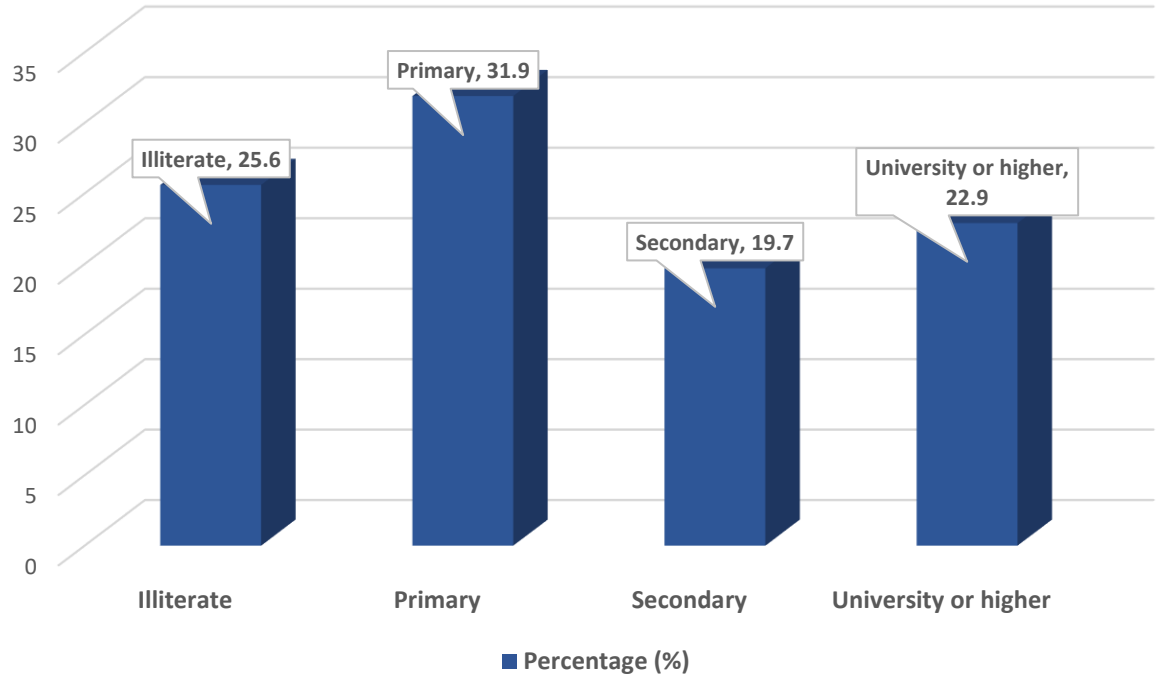

Figure 4.3: Distribution of Study Sample by Educational Level (n = 700)

4.1.4 Distribution of Participants by Occupation

Figure 4.4 illustrates the distribution of participants according to occupation. The majority of participants were housewives (72%), representing more than two-thirds of the study sample, whereas 28% were employed. The figure shows a clear predominance of housewives compared to employed participants.

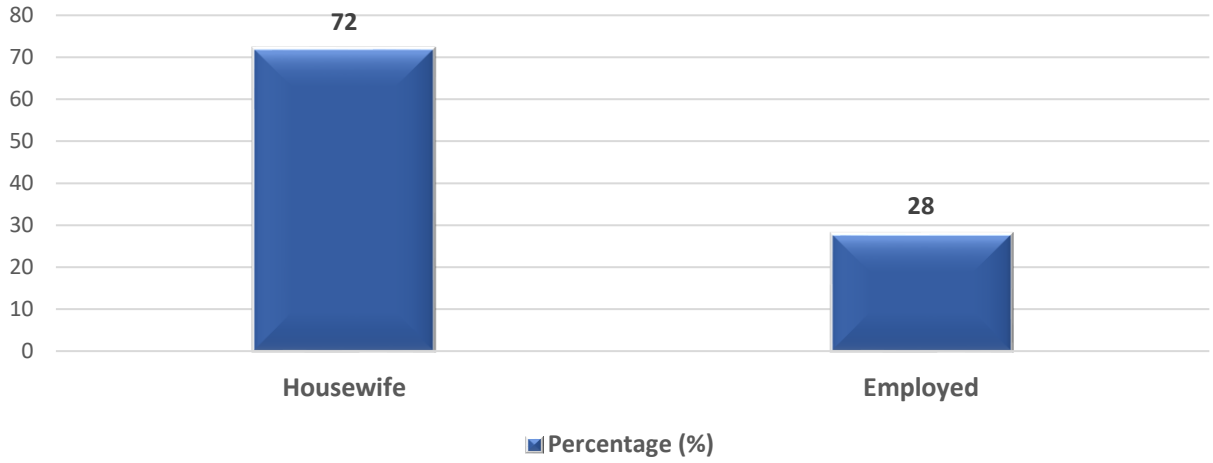

*Figure 4.4: **Distribution of Participants by Occupation (n = 700)***

4.1.5 Distribution of Participants by Site of Residence

Figure 4.5 shows the distribution of participants according to place of residence. The majority of participants were from urban areas (75.4%), while 24.6% were from rural areas.

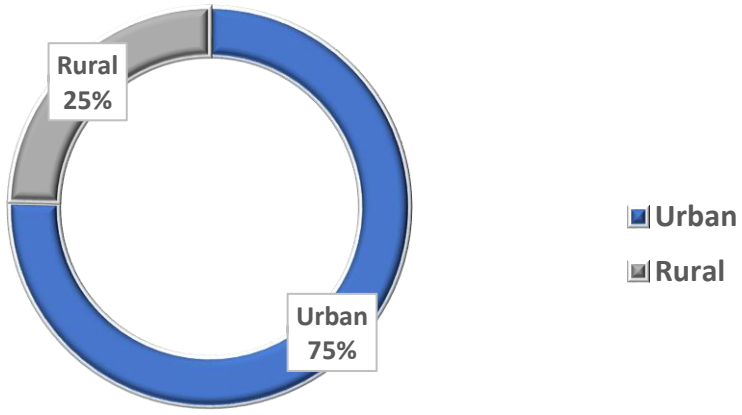

*Figure 4.5: **Distribution of Participants by Residence (n = 700)***

4.2 Obstetric History of the Participants

Table 4.1 demonstrates the obstetric history of the study participants in terms of the number of previous births and miscarriages. Regarding previous births, the highest proportion of participants reported having 3–4 births (36.4%), followed closely by those with 1–2 births (32.4%). A considerable proportion of participants had more than four births (25.7%), whereas only a small percentage had no previous births (5.4%), representing the lowest category.

In relation to miscarriage history, 32.9% of participants reported no previous miscarriages, while 31.7% experienced 1–2 miscarriages, showing a nearly similar distribution between these two groups. Additionally, 25.3% had 3–4 miscarriages, whereas 10.1% reported more than four miscarriages, constituting the smallest proportion.

This table demonstrates variability in obstetric history among participants, with a noticeable concentration in the moderate categories of both previous births and miscarriages.

Table 4.1: Obstetric History of the Participants (n = 700)

Variable	*Category*	*Frequency*	*Percentage (%)*
Number of Previous Births	*0*	38	5.4
	1–2	227	32.4
	3–4	255	36.4
	>4	180	25.7
Number of Miscarriages	*0*	230	32.9
	1–2	222	31.7
	3–4	177	25.3
	>4	71	10.1

4.3 Pregnancy-Related Threats among Participants

Table 4.2 Table (4.2) illustrates the distribution of pregnancy-related health threats reported by the study participants. Vaginal bleeding was the most frequently reported condition (44.3%), representing nearly half of the sample.

This was followed by other pregnancy-related threats (26.3%), indicating that a considerable proportion of participants experienced conditions not specifically categorized in the questionnaire. Additionally, high blood pressure (19.6%) and infection (18.9%) were reported by a notable proportion of participants.

In comparison, preeclampsia was reported by 14.6% of participants, while fetal growth restriction (8.9%) and gestational diabetes (7.7%) were less commonly reported, representing the lowest proportions among the listed conditions.

Furthermore, the majority of participants received treatment for these threats (79.3%), whereas a smaller proportion did not receive treatment. This funding demonstrates variation in the occurrence of pregnancy-related threats, with a higher concentration in certain conditions, such as vaginal bleeding, compared to others.

Table 4.2: Pregnancy-Related Threats among Participants (n = 700)

Variable	*Frequency*	*Percentage (%)*
Vaginal bleeding	310	44.3
Preeclampsia	102	14.6
Gestational diabetes	54	7.7
High blood pressure	137	19.6
Infection	132	18.9
Fetal growth restriction	62	8.9
Other threats	184	26.3
Received treatment	555	79.3

4.4 Patterns of Medication Use among the Participants

Table 4.3 provides a detailed overview of medication use patterns among the study participants during pregnancy. A substantial proportion of participants reported using medications, with 78.1% indicating medication use, reflecting a high level of exposure to pharmacological or supplementary treatments during pregnancy.

When examining the types of medications, pharmaceutical drugs constituted the largest category (71.7%), indicating that conventional medical treatments were predominantly utilized among the participants. This was followed by nutritional supplements (21.0%), which were used by a comparatively smaller but still notable proportion of the sample.

In contrast, the use of herbal remedies (3.6%) and other medications (3.9%) was markedly lower, representing only a small fraction of the participants. These categories showed minimal contribution relative to pharmaceutical drugs and supplements. Overall, the distribution demonstrates a clear variation in medication types, with a strong concentration in pharmaceutical drug use and a limited utilization of alternative or non-conventional therapies.

Table 4.3: Patterns of Medication Use among the Participants

Variable	*Frequency*	*Percentage (%)*
Use of medications during pregnancy	547	78.1
Pharmaceutical drugs	502	71.7
Nutritional supplements	147	21.0
Herbal remedies	25	3.6
Other medications	27	3.9

4.5 Awareness and Practices Related to Medication Use

Table 4.4 presents the level of awareness and medication-related practices among the participants. Regarding the source of prescription, the majority of participants reported that medications were prescribed by physicians (83.0%), while smaller proportions relied on personal or family experience (8.8%) and pharmacists (6.6%), with only 1.6% reporting other sources.

In terms of side effects, most participants indicated that they did not experience any side effects (60.5%), whereas 22.5% reported experiencing side effects, and 17.0% were uncertain. With respect to consultation practices, the majority of participants reported always consulting a doctor before taking medications (63.4%), followed by those who sometimes consulted (26.9%). A smaller proportion reported rarely consulting (7.9%), while only 1.8% did not consult at all.

Regarding awareness, more than half of the participants (58.5%) were aware that some herbs and supplements may be harmful to the fetus. However, 25.4% were unsure, and 16.1% were not aware of these potential risks.

Table 4.4: Awareness and Practices Related to Medication Use (n = 547)

Variable	*Category*	*Frequency*	*Percentage (%)*
Source of prescription	*Physician*	454	83.0
	Pharmacist	36	6.6
	Personal/Family	48	8.8
	Other	9	1.6
Side effects	*Yes*	123	22.5
	No	331	60.5
	I don't know	93	17.0
Doctor consultation	*Always*	347	63.4
	Sometimes	147	26.9
	Rarely	43	7.9
	Do not consult	10	1.8
Awareness of harmful effects	*Yes*	320	58.5
	No	88	16.1
	I don't know	139	25.4

4.6 Association between Medication Use and Socio-Demographic Characteristics

Table 4.5 presents the association between medication use during pregnancy and selected socio-demographic characteristics of the participants. A statistically significant association was observed between age and medication use ($p = 0.047$). The highest proportion of medication use was reported among participants aged 26–35 years (30.5%), followed by those aged 36–44 years (27.8%) and 18–25 years (26.0%), whereas the lowest proportion was observed among participants aged ≥45 years (15.7%).

Regarding educational level, no statistically significant association was found with medication use ($p = 0.126$). However, participants with primary education (33.8%) showed the highest proportion of medication use, followed by those with university education (23.0%), while lower proportions were observed among illiterate (24.1%) and secondary education (19.0%) groups.

A significant association was also found between marital status and medication use ($p = 0.014$). The majority of medication users were married (90.7%), whereas lower proportions were observed among divorced (5.1%) and widowed (4.2%) participants.

Similarly, occupation was significantly associated with medication use ($p = 0.045$). A higher proportion of medication use was observed among employed participants (29.8%) compared to those who were housewives (70.2%), considering the distribution within the medication user group.

In contrast, no statistically significant association was found between place of residence and medication use ($p = 0.116$), although a higher proportion of medication use was observed among participants residing in urban areas (76.8%) compared to rural areas (23.2%).

Table 4.5: **Association between Medication Use and Socio-Demographic Characteristics (n = 700)**

Variable	*Category*	*Used Medication n (%)* 547 (78.1%)	*Didn't Use n (%)* 153 (21.9%)	*Total*	*p-value*
Age	*18–25*	142 (26.0%)	44 (28.8%)	186	**0.047**
	26–35	167 (30.5%)	38 (24.8%)	205	
	36–44	152 (27.8%)	34 (22.2%)	186	
	≥45	86 (15.7%)	37 (24.2%)	123	
Educational level	*Illiterate*	132 (24.1%)	47 (30.7%)	179	0.126
	Primary	185 (33.8%)	38 (24.8%)	223	
	Secondary	104 (19.0%)	34 (22.2%)	138	
	University+	126 (23.0%)	34 (22.2%)	160	
Marital status	*Married*	496 (90.7%)	129 (84.3%)	625	**0.014**
	Divorced	28 (5.1%)	18 (11.8%)	46	
	Widowed	23 (4.2%)	6 (3.9%)	29	
Occupation	*Housewife*	384 (70.2%)	120 (78.4%)	504	**0.045**
	Employed	163 (29.8%)	33 (21.6%)	196	
Residence	*Rural*	127 (23.2%)	45 (29.4%)	172	0.116
	Urban	420 (76.8%)	108 (70.6%)	528	

4.7 Association between Medication Use and Obstetric History

Table 4.6 presents the association between medication use during pregnancy and obstetric history, including the number of previous births and miscarriages. A statistically significant association was found between the number of previous births and medication use (p = 0.018). The highest proportion of medication use was observed among participants with 3–4 previous births (39.3%), followed by those with 1–2 births (30.7%), while lower proportions were reported among participants with more than four births (24.3%) and those with no previous births (5.7%), representing the smallest group.

Similarly, a statistically significant association was observed between the number of miscarriages and medication use (p = 0.017). The highest proportion of medication use was reported among participants with 1–2 miscarriages (32.5%), followed by those with no history of miscarriage (30.0%). Lower proportions were observed among participants with 3–4 miscarriages (27.1%), while the lowest proportion was found among those with more than four miscarriages (10.4%).

Table 4.6: Association between Medication Use and Obstetric History (n = 700)

Variable	*Category*	*Used Medication n (%)* 547 (78.1%)	*Didn't Use n (%)* 153 (21.9%)	*Total*	*p-value*
Number of previous births	*0*	31 (5.7%)	7 (4.6%)	38	**0.018**
	1–2	168 (30.7%)	59 (38.6%)	227	
	3–4	215 (39.3%)	40 (26.1%)	255	
	>4	133 (24.3%)	47 (30.7%)	180	
Number of miscarriages	*0*	164 (30.0%)	66 (43.1%)	230	**0.017**
	1–2	178 (32.5%)	44 (28.8%)	222	
	3–4	148 (27.1%)	29 (19.0%)	177	
	>4	57 (10.4%)	14 (9.2%)	71	

4.8 Association between Medication Use and Pregnancy-Related Threats

Table 4.7 presents the association between medication use during pregnancy and various pregnancy-related threats. No statistically significant association was observed between vaginal bleeding and medication use ($p = 0.381$), indicating similar proportions of medication use among participants with and without vaginal bleeding.

In contrast, several pregnancy-related conditions showed statistically significant associations with medication use. Participants with preeclampsia reported higher medication use (16.5%) compared to those without (7.8%) ($p = 0.008$). Similarly, gestational diabetes was significantly associated with medication use, with higher proportions among affected participants (9.1%) compared to those without the condition (2.6%) ($p = 0.007$).

A highly significant association was observed between high blood pressure and medication use ($p < 0.001$), where a notably higher proportion of medication use was reported among participants with high blood pressure (22.7%) compared to those without (8.5%).

Likewise, infection was significantly associated with medication use ($p = 0.001$), with higher usage among participants experiencing infection (21.4%) compared to those who did not (9.8%).

In addition, fetal growth restriction showed a statistically significant association with medication use ($p = 0.035$), although with lower overall proportions.

Furthermore, a strong and highly significant association was found between medication use and other pregnancy-related threats ($p < 0.001$), where participants reporting other complications demonstrated distinct patterns of medication use.

Overall, the findings indicate that most pregnancy-related complications were significantly associated with increased medication use, except for vaginal bleeding, which did not show a statistically significant relationship.

Table 4.7: Association between Medication Use and Pregnancy-Related Threats (n = 700)

Variable	***Used Medication n (%)*** 547 (78.1%)	***Didn't Use n (%)*** 153 (21.9%)	***Total***	***p-value***
Vaginal bleeding	247 (45.2%)	63 (41.2%)	310	0.381
Preeclampsia	90 (16.5%)	12 (7.8%)	102	**0.008**
Gestational diabetes	50 (9.1%)	4 (2.6%)	54	**0.007**
High blood pressure	124 (22.7%)	13 (8.5%)	137	**<0.001**
Infection	117 (21.4%)	15 (9.8%)	132	**0.001**
Fetal growth restriction	55 (10.1%)	7 (4.6%)	62	**0.035**
Other threats	104 (19.0%)	80 (52.3%)	184	**<0.001**

4.9 Factors Associated with Medication Use during Pregnancy

Table 4.8 presents the results of the binary logistic regression analysis identifying the independent predictors of medication use during pregnancy. The analysis revealed that occupation was a significant predictor ($p = 0.038$), where employed participants were more likely to use medications compared to housewives (OR = 1.626, 95% CI: 1.027–2.573).

Similarly, high blood pressure showed a statistically significant association ($p = 0.009$), with participants having high blood pressure being approximately 2.4 times more likely to use medications (OR = 2.407, 95% CI: 1.251–4.633). In addition, infection was identified as a significant predictor ($p = 0.009$), where participants with infections were about 2.3 times more likely to use medications (OR = 2.308, 95% CI: 1.235–4.311).

Conversely, other pregnancy-related threats were significantly associated with a lower likelihood of medication use ($p < 0.001$), with an odds ratio of 0.369 (95% CI: 0.228–0.600). In contrast, no statistically significant associations were observed for age, marital status, number of previous births, number of miscarriages, preeclampsia, gestational diabetes, and fetal growth restriction ($p > 0.05$).

Table 4.8: Factors Associated with Medication Use during Pregnancy (n = 700)

Variable	*B*	*OR (Exp(B))*	*95% CI*	*p-value*
Age	-0.213	0.808	0.650 – 1.005	0.056
Marital status	-0.264	0.768	0.510 – 1.155	0.204
Occupation	0.486	**1.626**	1.027 – 2.573	**0.038**
Number of previous births	0.031	1.031	0.818 – 1.301	0.794
Number of miscarriages	0.080	1.083	0.934 – 1.255	0.291
Preeclampsia	0.445	1.561	0.783 – 3.112	0.206
Gestational diabetes	0.953	2.593	0.886 – 7.589	0.082
High blood pressure	0.879	**2.407**	1.251 – 4.633	**0.009**
Infection	0.836	**2.308**	1.235 – 4.311	**0.009**
Fetal growth restriction	0.702	2.019	0.854 – 4.772	0.110
Other threats	-0.996	**0.369**	0.228 – 0.600	**<0.001**
Constant	1.181	3.257	—	0.028

Chapter V: Discussion

The present study investigated the patterns of medication use during pregnancy and their association with pregnancy-related conditions, socio-demographic factors, and awareness among pregnant women in Sana'a City, Yemen. The findings revealed a high prevalence of medication use, with 78.1% of participants reporting the use of at least one medication during pregnancy. This prevalence is consistent with recent international evidence, which indicates that medication use during pregnancy is widespread, with rates exceeding 85% in many high-income settings **(Alwan and Grant, 2024; Sillis *et al.*, 2026)**. Although the prevalence observed in this study is slightly lower, this difference may be attributed to variations in healthcare access, prescribing practices, and the availability of medications in low-resource settings such as Yemen.

In terms of medication types, the predominance of pharmaceutical drugs over herbal remedies observed in this study mirrors patterns reported in recent global studies, in which prescribed medications and supplements account for the majority of drug exposure during pregnancy **(Mansour *et al.*, 2024; Ezenwaeze *et al.*, 2025)**. This finding suggests an increasing reliance on formal healthcare services, particularly in hospital-based populations. However, the relatively low use of herbal remedies contrasts with findings from other developing regions, where traditional medicine use remains more prevalent, highlighting potential differences in cultural practices and healthcare-seeking behavior.

The study further demonstrated significant associations between medication use and several pregnancy-related conditions, including high blood pressure, infection, preeclampsia, and gestational diabetes. These findings are consistent with existing literature, which identifies maternal clinical conditions as key drivers of medication use during pregnancy **(Winterfeld *et al.*, 2025)**. Notably, high blood pressure and infection emerged as independent predictors of medication use in the regression analysis, indicating that women with these conditions were significantly

more likely to use medications. This is clinically expected, as hypertensive disorders and infections require pharmacological intervention to prevent serious maternal and fetal complications. Similar associations have been reported in pharmacological studies, where maternal comorbidities were strongly linked to increased medication exposure during pregnancy **(Coppola *et al.*, 2022)**.

In addition to clinical factors, socio-demographic characteristics were also found to influence medication use. Significant associations were observed with age, marital status, and occupation. These findings are partially supported by previous research indicating that socio-demographic factors can affect healthcare utilization and medication access **(Alwan and Grant, 2024; Mansour *et al.*, 2024)**. For example, employed women may have better financial resources and access to healthcare services, which can increase the likelihood of medication use **(SteelFisher *et al.*, 2020)**. However, the lack of a significant association between educational level and medication use in this study differs from findings in some international studies, in which higher education is often associated with greater awareness and safer medication practices **(Ezenwaeze *et al.*, 2025; Winterfeld *et al.*, 2025)**. This discrepancy may reflect contextual differences in health literacy and healthcare systems.

Regarding awareness and practices, the study found that most medications were prescribed by physicians and that most participants reported consulting healthcare providers before taking them. This reflects a relatively high level of engagement with formal healthcare services, which is considered a positive indicator of maternal healthcare utilization **(SteelFisher *et al.*, 2020)**. Nevertheless, awareness of the potential risks associated with herbal remedies and supplements was only moderate, suggesting the presence of knowledge gaps among pregnant women. This finding is consistent with previous studies, which have reported that pregnant women often have a limited understanding of medication safety, particularly regarding over-the-

counter drugs and non-prescribed substances **(Winterfeld *et al.*, 2025; Alwan and Grant, 2024)**. Furthermore, reliance on informal sources of information, such as family members or community advice, has been identified as a common practice in similar settings, potentially increasing the risk of inappropriate medication use **(SteelFisher *et al.*, 2020; Winterfeld *et al.*, 2025)**.

Chapter VI: Conclusion and Recommendations

6.1 Conclusion

This study assessed medication use during pregnancy and its association with pregnancy-related threats, as well as awareness and related practices among pregnant women. The findings revealed that medication use during pregnancy was highly prevalent, with more than three-quarters of participants reporting medication use. Pharmaceutical drugs were the most commonly used, while the use of herbal remedies and other medications was relatively low. Significant associations were identified between medication use and several socio-demographic and obstetric factors, including age, marital status, occupation, number of previous births, and history of miscarriages. Furthermore, medication use was significantly associated with multiple pregnancy-related threats, particularly high blood pressure, infection, preeclampsia, and gestational diabetes. Among these, high blood pressure and infection emerged as the strongest independent predictors of medication use based on logistic regression analysis.

The study also demonstrated that most medications were prescribed by physicians, and the majority of participants reported consulting a doctor before medication use. However, awareness regarding the potential harmful effects of herbs and supplements was only moderate, indicating the presence of knowledge gaps. These findings highlight the importance of clinical conditions and healthcare practices in influencing medication use during pregnancy, emphasizing the need for improved awareness and safe medication practices among pregnant women.

6.2 Strength of the Study

This study has several strengths that enhance the validity and importance of its findings. First, the study included a large sample size (n = 700), which increases the reliability of the results and improves the statistical power of the analysis.

Second, the study comprehensively assessed multiple dimensions related to medication use during pregnancy, including socio-demographic characteristics, obstetric history, pregnancy-related threats, and awareness and practices, providing a holistic understanding of the topic.

Third, the use of advanced statistical analysis, including chi-square tests and binary logistic regression, allowed for the identification of independent predictors of medication use, strengthening the analytical rigor of the study. Additionally, the study addressed an important public health issue by focusing on medication use and safety during pregnancy, which is a critical concern for both maternal and fetal health.

Finally, the findings of this study provide valuable baseline data that can support future research and guide healthcare interventions aimed at improving safe medication practices among pregnant women.

6.2 Limitations of the Study

Despite the valuable findings of this study, several limitations should be acknowledged. First, the cross-sectional design of the study limits the ability to establish causal relationships between medication use and associated factors. The observed associations cannot confirm cause-and-effect relationships.

Second, the study relied on self-reported data, which may be subject to recall bias or reporting inaccuracies, particularly regarding medication use and pregnancy-related conditions.

Third, the study did not include detailed information about the types, dosages, and duration of medications used, which may limit the depth of analysis regarding medication safety and potential effects. Additionally, some variables, particularly in the awareness section, were analyzed descriptively due to data structure limitations, which restricted the use of inferential statistical tests. Finally, the study was

conducted within a specific population, which may limit the generalizability of the findings to other populations or settings.

6.3 Recommendations

Based on the results of the current study, the study recommends the following:

- ✓ Enhance health education programs to improve awareness among pregnant women regarding the safe use of medications, especially the risks associated with herbal remedies and supplements.
- ✓ Strengthen physician guidance and counseling to ensure that pregnant women receive clear and accurate information about medication use during pregnancy.
- ✓ Promote regular antenatal care visits for early detection and proper management of pregnancy-related complications such as high blood pressure and infections.
- ✓ Provide targeted interventions for high-risk groups, particularly women with pregnancy-related conditions, who are more likely to use medications and require closer monitoring.
- ✓ Increase public awareness about medication safety through health campaigns emphasizing the risks of self-medication and the importance of consulting healthcare professionals.
- ✓ Encourage further research focusing on the types, safety, dosage, and long-term effects of medications used during pregnancy using more robust study designs.

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Appendices

Appendix I: Questionnaire

Republic of Yemen
Ministry of Education and Scientific Research
21 September University of Medical and Applied Sciences

الجمهورية اليمنية
وزارة التربية والتعليم والبحث العلمي
جامعة ٢١ سبتمبر للعلوم الطبية والتطبيقية

Assessment for Threats of Medication Use and Their Impact on Pregnant Women at Al-Sabeen and Kuwait Hospitals in Sana'a City, Yemen

A2

Dear participant,

Thank you for taking part in this important survey. Your participation will help assess the threats associated with medication use and their impact on pregnant women at Al-Sabeen and Kuwait Hospitals in Sana'a City, Yemen.

All information you provide will remain strictly confidential and will be used solely for scientific research purposes.

With sincere thanks and appreciation,

The Research Team

Faculty of Higher Nursing, 21 September University

First Part: Socio-Demographic Characteristics

No.	*Question*	*Options*
1	***Age***	☐ 18–25 ☐ 26–35 ☐ 36–44 ☐ ≥45
2	***Educational level***	☐ Illiterate ☐ Primary ☐ Secondary ☐ University or higher
3	***Marital status***	☐ Married ☐ Divorced ☐ Widowed
4	***Occupation***	☐ Housewife ☐ Employed
5	***Place of residence***	☐ Rural ☐ Urban

Second Part: Obstetric and Gynecological Characteristics

No.	*Question*	*Options*
1	***Number of previous births***	☐ 0 ☐ 1–2 ☐ 3–4 ☐ >4
2	***Number of miscarriages***	☐ 0 ☐ 1–2 ☐ 3–4 ☐ >4

Third Part: Pregnancy Threats

No.	*Question*	*Options*
1	***Vaginal bleeding during pregnancy***	☐ Yes ☐ No
2	***Preeclampsia (pregnancy toxemia)***	☐ Yes ☐ No
3	***Gestational diabetes***	☐ Yes ☐ No
4	***High blood pressure***	☐ Yes ☐ No
5	***Infection during pregnancy***	☐ Yes ☐ No
6	***Fetal growth restriction***	☐ Yes ☐ No
7	***Other pregnancy-related threats***	☐ Yes ☐ No
8	***Received treatment for these conditions***	☐ Yes ☐ No

Fourth Part: Medication Use

No.	*Question*	*Options*
1	***Did you use any medications during pregnancy?***	☐ Yes ☐ No
2	***Type of medications used***	☐ Pharmaceutical drugs ☐ Nutritional supplements ☐ Herbal remedies ☐ Other

Fifth Part: Awareness and Practices

No.	*Question*	*Options*
1	***Source of prescription***	☐ Physician ☐ Pharmacist ☐ Personal/family ☐ Other
2	***Side effects experienced***	☐ Yes ☐ No ☐ I don’t know
3	***Doctor consultation before medication***	☐ Always ☐ Sometimes ☐ Rarely ☐ Do not consult
4	***Awareness of the harmful effects of herbs/supplements***	☐ Yes ☐ No ☐ I don’t know

الخلاصة

خلفية: يُعد استخدام الأدوية أثناء الحمل أمرًا شائعًا، إلا أنه قد يشكل مخاطر على صحة الأم والجنين. ويُعد فهم هذه المخاطر والعوامل المؤثرة في استخدام الأدوية أمرًا ضروريًا لتحسين النتائج الصحية للأم والجنين.

الهدف: هدفت هذه الدراسة إلى تقييم مخاطر استخدام الأدوية وتأثيرها على النساء الحوامل في مستشفيي السبعين والكويت بمدينة صنعاء، اليمن، بالإضافة إلى دراسة العوامل المرتبطة ومستوى الوعي والممارسات ذات الصلة.

المنهجية: أُجريت دراسة مقطعية على ٧٠٠ امرأة حامل. تم جمع البيانات باستخدام استبيان منظم شمل الخصائص الديموغرافية والاجتماعية، والتاريخ التوليدي، والمشكلات المرتبطة بالحمل، واستخدام الأدوية، ومستوى الوعي. تم استخدام الإحصاء الوصفي، واختبار كاي-تربيع، والانحدار اللوجستي الثنائي لتحديد العوامل المرتبطة باستخدام الأدوية.

النتائج: كان انتشار استخدام الأدوية أثناء الحمل مرتفعًا (٧٨,١٪)، وارتبط بشكل معنوي بالعوامل الديموغرافية والتوليدية ($p < 0.05$). كما وُجدت ارتباطات معنوية مع عدة مضاعفات حملية، منها تسمم الحمل، وسكري الحمل، وارتفاع ضغط الدم، والعدوى، وتقييد نمو الجنين. وأظهر تحليل الانحدار اللوجستي أن ارتفاع ضغط الدم، والعدوى، والحالة الوظيفية من أهم العوامل المستقلة المرتبطة باستخدام الأدوية. كما تبين أن معظم الأدوية وُصفت من قبل الأطباء، وأن غالبية المشاركات استشرن الطبيب قبل استخدامها، إلا أن مستوى الوعي بمخاطر الأعشاب والمكملات كان متوسطًا.

الاستنتاجات: يُعد استخدام الأدوية أثناء الحمل شائعًا ومرتبطًا بعدة عوامل سريرية وديموغرافية. وكان كل من ارتفاع ضغط الدم والعدوى من أبرز العوامل المؤثرة، مما يؤكد أهمية تعزيز الوعي وتشجيع الممارسات الآمنة لاستخدام الأدوية لدى النساء الحوامل.

الكلمات المفتاحية: استخدام الأدوية، الحمل، صحة الأم، مضاعفات الحمل، الوعي، اليمن

الجمهورية اليمنية
وزارة التربية والتعليم والبحث العلمي
جامعة ٢١ سبتمبر للعلوم الطبية والتطبيقية
كلية التمريض العالي
Faculty of Higher Nursing

تقييم مخاطر استخدام الأدوية وتأثيرها على النساء الحوامل في مستشفيي السبعين والكويت بمدينة صنعاء، اليمن

مشروع بحث مقدم الى كلية التمريض العالي جامعة ٢١ سبتمبر كاستيفاء جزئي لمتطلبات الحصول على درجة بكالوريوس عالي في التمريض

الباحثـــــــــــــــون

فيروز احمد يحي بدر
شيماء علي سعد البهلولي
رحاب عبد الله عبد الله قلاله
عادل محسن محمد الجمالي
وليد خالد حسين غبش
عادل شوقي شوقي عبده
ندى حامد اسعد عبده
خديجة عبد الواحد سيف
اسرار حامد اسعد عبده حسن
عبد الله عزي محمد المنتصر
حامس محمد احمد حاتم بلاله
ندى مهدي الصرح
عدنان عبد السلام بجاش سلمان
احمد سنان محمد زحيم
رشاء محمد احمد فارع
رشدي شوقي عبد الله عطيه

مشرف البحث

د/ حورية الصبري

أستاذ مساعد طب المجتمع بجامعة ٢١ سبتمبر

١٤٤٧هـ - ٢٠٢٦م