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Improving Fetal Outcomes in High-Risk Pregnancy: Aspirin Prophylaxis and Growth Restriction Surveillance

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Abstract

Objectives: Low-dose aspirin is widely recommended for women at increased risk of intrauterine growth restriction (IUGR) or preeclampsia (PET), yet real-world adherence and outcomes remain variable. This study evaluated adherence to aspirin prophylaxis in high-risk pregnancies and examined associations with maternal and neonatal outcomes.

Materials and Methods: A total of 140 women were included, comprising 75 in the IUGR surveillance cohort and 65 in the PET cohort. Adherence was assessed across three domains: initiation before 16 weeks, use of the recommended 75–150 mg dose, and continuation until at least 36 weeks or delivery. Maternal and neonatal outcomes included recurrent IUGR, development of PET, neonatal intensive care unit (NICU) admission, birthweight, and gestational age. Statistical analysis included descriptive summaries, chi-square tests, and Welch's t-tests.

Results: Adherence to the recommended dose was universal (100%) across both cohorts, but initiation (77% in IUGR, 83% in PET) and duration adherence (75% in IUGR, 63% in PET) were less consistent, resulting in overall adherence rates of 59% and 52%, respectively. Recurrent IUGR occurred in 21% of the IUGR cohort, while PET developed in 19% of the PET group. NICU admission was more frequent in the PET cohort (29%) compared with the IUGR group (20%). Importantly, adherence was associated with higher birthweight in the IUGR cohort (2959 g vs 2713 g, $P = 0.041$), although the observed difference was modest, and no significant effect was observed on gestational age or PET outcomes.

Conclusions: These findings highlight that while aspirin prophylaxis is widely adopted, persistence remains suboptimal, particularly with respect to duration adherence.

Keywords: Aspirin prophylaxis, Intrauterine growth restriction, Preeclampsia, Adherence, Pregnancy outcomes, Neonatal care

Introduction

Pregnancy complications remain a major challenge in maternal and perinatal health, with hypertensive disorders of pregnancy and intrauterine growth restriction (IUGR) ranking among the most significant contributors to maternal morbidity, stillbirth, and neonatal mortality (1,2). Pre-eclampsia (PET), a hypertensive disorder characterized by new-onset hypertension and proteinuria or maternal organ dysfunction after 20 weeks' gestation, affects approximately 2%–8% of pregnancies worldwide and remains a leading cause of maternal and perinatal death (3). IUGR, often defined as failure of the fetus to reach its genetic growth potential, complicates 8%–10% of pregnancies globally, and is associated with a four- to ten-fold increase in stillbirth, alongside long-term risks such as neurodevelopmental impairment and adult cardiovascular disease (CLASP Collaborative Group, 1994). Both PET and IUGR are associated with substantial healthcare costs, particularly in tertiary maternity centres (4,5).

In recent decades, prophylactic low-dose aspirin has emerged as a cornerstone intervention in the prevention of PET and IUGR. The rationale is rooted in pathophysiology: both conditions are strongly linked to abnormal placentation and impaired uteroplacental blood flow, often mediated by inadequate trophoblastic invasion and dysregulated maternal endothelial function. Aspirin, at doses between 75 and 150 mg daily, irreversibly inhibits platelet cyclo-oxygenase and thereby reduces thromboxane A_2 while sparing prostacyclin, improving the balance between vasoconstriction and vasodilation. This antiplatelet effect is believed to enhance uteroplacental perfusion and reduce the likelihood of ischemia-related complications, thereby lowering the incidence of both PET and IUGR (6,7)

Evidence for aspirin's preventive effect has steadily accumulated (8,9). The Collaborative Low-dose Aspirin Study in Pregnancy (CLASP Collaborative Group, 1994) was one of the earliest large randomized controlled trials, enrolling over 9,000 women. While overall benefits were modest, subgroup analyses suggested clinically meaningful risk reductions in high-risk women (10). Subsequent meta-analyses strengthened this signal, particularly when aspirin was initiated before 16 weeks' gestation. Roberge

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Key Messages

- Aspirin adherence is suboptimal, especially in later pregnancy, limiting its real-world effectiveness.
- Improved aspirin adherence was associated with higher birthweight in pregnancies at risk of growth restriction.
- Aspirin is one vital component within a broader strategy requiring sustained adherence and integrated fetal surveillance.

et al demonstrated in a systematic review that early initiation reduced the risk of preterm PET by more than 60% and IUGR by nearly 20% (11,12). The ASPRE trial (13) provided robust, high-quality evidence that 150 mg of aspirin taken nightly from 11–14 weeks' gestation until 36 weeks reduced the incidence of preterm PET by 62% (11). These findings underpin contemporary guidelines.

Current international recommendations are consistent in advocating aspirin prophylaxis for high-risk pregnancies. The National Institute for Health and Care Excellence (NICE) (12) recommends 75–150 mg daily from 12 weeks until birth for women with one high-risk factor (e.g., previous PET, chronic hypertension, diabetes, renal disease) or at least two moderate-risk factors (13). The Royal College of Obstetricians and Gynaecologists (RCOG) and the Irish Health Service Executive (HSE) make similar recommendations, with emphasis on starting prophylaxis before 16 weeks (14,15). Local maternity hospitals, including The Coombe, have adopted these guidelines into clinical pathways, often embedding aspirin prescribing into antenatal booking visits and risk assessment tools.

Despite strong guideline support, real-world practice often shows variation in adherence. Published audits in the UK and Ireland reveal that while initiation and dose adherence are generally high, duration adherence, continuing aspirin until 36 weeks or delivery, tends to lag (16,17). Factors such as pill burden, forgetfulness, and inconsistent documentation contribute to this variation. Moreover, analysis of compliance in the ASPRE trial highlighted that adherence above 90% was necessary to achieve the maximal preventive effect, underlining the importance of sustained aspirin use throughout pregnancy (18).

In The Coombe Hospital, one of the major tertiary referral centres, two congruent audits were created to meet this requirement. The former (Audit A) provides a study of women with a history of IUGR, who were prescribed aspirin during the subsequent pregnancy, and seeks to measure compliance with standards of initiation, dosage, and duration, as well as to indicate the recurrence of IUGR and related outcomes. Audit B (2) studies women who should take aspirin to prevent PET, evaluating key adherence areas with a follow-up of PET incidence rates, gestational hypertension, and birth outcomes. Both audits cover the period January to July 2024, using standardized hospital clinical audit forms and approved by the local Audit Quality Assurance (AQuA) governance framework.

This type of dual audit design can be regarded as a distinctive chance to assess how aspirin prophylaxis is implemented in two high-risk groups that overlap but are not identical. While the biological rationale and guideline recommendations are clear, translation into consistent practice remains uncertain without systematic evaluation. By combining data on adherence and outcomes, this project not only measures compliance but also links it to clinically relevant endpoints, such as recurrent IUGR and PET.

The significance of this work extends beyond compliance measurement. In a maternity service where adverse outcomes are closely scrutinized, evidence of strong adherence provides reassurance to clinicians and service users, while identification of gaps can drive targeted QI initiatives. For example, if duration adherence is found to be suboptimal, interventions might include antenatal electronic health record (EHR) prompts, pharmacy-supported counselling, or patient education leaflets.

Aim of the Study

This paper presents the findings of two retrospective clinical audits assessing the use of low-dose aspirin in high-risk pregnancies at The Coombe Hospital. Specifically, the objectives are:

- To assess adherence to guideline standards for aspirin prophylaxis (initiation, dosage, duration).
- To estimate maternal–fetal outcomes, including recurrent IUGR, PET, gestational hypertension, birth weight, and NICU admission.
- To identify opportunities for quality improvement and recommend interventions for future audit cycles.

This work was undertaken as a quality improvement audit to evaluate adherence to aspirin prophylaxis and to inform future audit cycles and service-level interventions. By systematically evaluating aspirin prophylaxis and linking practice patterns to maternal–fetal outcomes, this dual audit contributes to both local service improvement and the broader literature on optimizing fetal outcomes in high-risk pregnancy.

Literature Review

Pathophysiology of Pre-eclampsia and Fetal Growth Restriction

PET and intrauterine/fetal growth restriction (FGR/IUGR) are major placenta-mediated disorders in obstetrics (19,20). Both conditions are characterised by impaired spiral-artery remodelling in early pregnancy, resulting in high-resistance uteroplacental blood flow and placental hypoperfusion (21,22). These abnormalities contribute to maternal endothelial dysfunction and reduced placental transfer of oxygen and nutrients, leading to hypertensive manifestations and impaired fetal growth (23-25).

Early-onset FGR is associated with increased risks of

stillbirth and neonatal morbidity, necessitating structured surveillance and timely delivery to balance fetal compromise against prematurity (26).

Rationale and Mechanism for Low-Dose Aspirin

Low-dose aspirin exerts its effect primarily through irreversible inhibition of platelet cyclooxygenase-1 (COX-1), which preferentially suppresses thromboxane A_2 over prostacyclin. This biochemical rebalancing favors vasodilation, reduced platelet aggregation, and improved microvascular blood flow. In the context of pregnancy, these effects are hypothesized to enhance uteroplacental perfusion, mitigate microthrombotic placental lesions, and reduce the risk of placenta-mediated complications when started sufficiently early (3).

The rationale for early initiation is grounded in placental biology: by the end of the first trimester, spiral-artery remodeling is largely complete. Thus, aspirin's capacity to modify placental vascular development is maximized if treatment begins before 16 weeks' gestation. Clinical evidence corroborates this, showing that timing and dose thresholds, particularly initiation in the late first trimester and doses ≥100–150 mg, are key determinants of efficacy (11,13).

Evidence From Randomized Trials and Meta-analyses

Initial randomized trials, most notably the CLASP study, suggested only modest benefit of aspirin prophylaxis when all women were considered together (CLASP Collaborative Group, 1994). However, subgroup analyses hinted at greater efficacy among women with high-risk profiles. Later meta-analyses refined these observations by focusing on timing and dose. For example, Bujold et al reported that aspirin commenced before 16 weeks reduced the incidence of PET by approximately 50% and FGR by about 20% (3).

Building on this, Roberge et al confirmed that doses at or above 100 mg, particularly when initiated early, produced the greatest reductions in preterm PET (11). The landmark ASPRE trial (13) provided robust evidence: in 1,776 high-risk pregnancies, 150 mg nightly aspirin reduced preterm PET by 62% compared with placebo. Importantly, adherence analysis from ASPRE (18) revealed that benefits were concentrated among women who achieved >90% compliance. These data collectively illustrate that aspirin's clinical effect is highly sensitive to both timing and sustained intake.

Current Guidelines

International guidelines have incorporated this evidence base. The NICE NG133 guideline recommends prescribing 75–150 mg daily from 12 weeks until birth for women with one high-risk factor (such as prior PET, chronic hypertension, chronic kidney disease, autoimmune disease, or pregestational diabetes) or two moderate-risk factors (12). Similarly, the RCOG Green-top Guideline No. 31 (2024 update) provides detailed pathways for the investigation and management of suspected small-for-gestational-age and growth-restricted fetuses, integrating Doppler-based surveillance with recommendations for delivery timing (27).

Together, these guidelines establish the contemporary practice standards against which local service audits should be judged. Importantly, they do not merely advise initiation of prophylaxis but emphasize the need for consistent dosing and continuation to delivery. The harmonisation of national and specialty guidelines ensures a unified message to clinicians and patients, although variation in implementation remains common.

Adherence and Real-World Implementation

Despite strong evidence and clear guidelines, real-world adherence to aspirin prophylaxis is variable. Systematic reviews show that initiation after risk assessment at booking is usually successful, but continuation through to 36–37 weeks is more vulnerable to drop-off (28). Contributing factors include pill burden, side-effect concerns, inconsistent reinforcement by clinicians, and lack of clarity regarding the appropriate stop date. Qualitative work further highlights unintentional omissions, gaps in provider–patient communication, and fragmented follow-up as common barriers (15).

The compliance data from ASPRE reinforce that sustained adherence is critical: the protective effect was strongest among women who achieved near-complete compliance (18). These insights suggest that prescribing aspirin at booking is insufficient; robust systems must support adherence throughout pregnancy. Strategies include EHR prompts, pharmacy-supported counselling, and standardized antenatal messaging. Audit-and-feedback cycles can monitor adherence rates and identify areas for targeted intervention.

Surveillance of Fetal Growth Restriction

Even with optimal pharmacologic prophylaxis, some women will develop FGR, underscoring the importance of structured surveillance. Evidence from the TRUFFLE collaboration demonstrated that protocolised monitoring can reduce perinatal mortality through informed delivery timing, although at the cost of increased prematurity (29,30).

Current RCOG guidance incorporates this evidence into practical clinical pathways, recommending gestational-age–appropriate surveillance and Doppler-based assessment to balance the risks of prematurity against ongoing intrauterine compromise (27).

Synthesis and Implications for the Present Audit

Three themes emerge from the literature. First, aspirin is effective when started early, dosed adequately, and taken consistently until delivery; hence, implementation quality is as important as identifying eligible women. Second,

adherence, particularly duration adherence, remains the most fragile component in practice. Without reinforcing continuation beyond the second trimester, real-world effectiveness may fall short of trial efficacy. Interventions such as structured counselling, EHR reminders, and pharmacist-led reinforcement have potential to close this gap. Third, for women who develop FGR despite prophylaxis, evidence-based surveillance remains essential. Protocolized monitoring using Doppler and CTG supports timely delivery decisions that reduce perinatal mortality, albeit with trade-offs in prematurity.

Taken together, these findings justify the present audit's dual focus: to measure adherence comprehensively (initiation, dose, duration) and to relate adherence patterns to maternal and neonatal outcomes. By benchmarking local practice against global standards, the audit can identify gaps, inform quality improvement, and guide a re-audit cycle. This synthesis underlines that aspirin prophylaxis is only as effective as its implementation and that outcomes ultimately depend on both pharmacologic and surveillance strategies.

Materials and Methods

Study Design

This study was designed as a retrospective clinical audit undertaken at The Coombe Hospital, a large tertiary maternity referral centre. The audit was structured in accordance with the institutional AQuA framework and was approved by the hospital's Clinical Audit Committee as a service evaluation project. Because the work involved a review of existing practice and anonymized hospital records, formal research ethics approval was not required. The audit comprised two linked arms. The first (Audit A) focused on women with a documented history of IUGR who were subsequently prescribed low-dose aspirin in a later pregnancy. The second (Audit B) was women who received aspirin prophylaxis with the special purpose of preventing PET. Through the examination of the two groups, the project also attempted to get a practice pattern of two overlapping yet distinct high-risk cohorts. The audit has been extended to January through July 2024.

Study Population and Eligibility

Eligible cases were identified through the hospital's maternity information system and EHRs. Inclusion criteria were restricted to singleton pregnancies where aspirin prophylaxis had been prescribed for IUGR prevention (Audit A) or for PET prevention (Audit B). Women taking aspirin due to unrelated medical reasons, including cardiovascular disease, were excluded and those with multiple gestations.

Standards and Benchmarks

The standards of audit were based on internationally recognized standards. The NICE (12) recommends that women who have already had PET, who have chronic hypertension, renal disease, autoimmune disease, or pregestational diabetes or who have at least two moderate risks factors should be initiated on low-dose aspirin. The RCOG (27) further indicates that aspirin must be initiated preferably at the distance of 16 weeks of pregnancy, at 75-150mg/day, and continued until 36 weeks or birth. These recommendations formed the benchmark against which adherence was measured.

In addition, evidence from the ASPRE trial highlighted that prophylactic efficacy is greatest when aspirin is commenced early and maintained with high compliance, particularly beyond 90% of prescribed doses (13,18). These findings justified the emphasis on initiation, dosage, and duration as key adherence domains in this audit.

Data Collection

Data collection was performed using a structured pro forma designed for the audit. Maternal characteristics recorded included age, body mass index, parity, and relevant comorbidities. Details of aspirin prescribing were extracted, including gestational age at initiation, dosage prescribed, documentation of compliance, and gestational age at discontinuation. Pregnancy outcomes of interest were recurrence of IUGR, the development of PET or gestational hypertension, birth weight centiles, gestational age at delivery, mode of delivery, and neonatal intensive care unit (NICU) admission. Where electronic records were incomplete, information was cross-checked against pharmacy dispensing logs and antenatal clinic documentation.

Data Analysis

All data were anonymized before analysis. Information was initially entered into Microsoft Excel and subsequently analyzed using Python version 3.12. The pandas library was used for data management and descriptive statistics, while scipy was applied for inferential tests. Group comparisons between women who were fully adherent versus non-adherent to aspirin prophylaxis were made using chi-square tests for categorical variables and independent-samples t tests for continuous variables.

Data visualization was performed using matplotlib and seaborn, generating bar charts to illustrate adherence across initiation, dosage, and duration domains, as well as line graphs to demonstrate trends in birth weight centiles across gestational age. Comparative outcome tables were also constructed to summarize recurrence of IUGR, incidence of PET, and NICU admissions.

Results

Baseline Characteristics and Adherence

A total of 140 women were included in this audit, with 75 in the IUGR surveillance cohort and 65 in the PET prophylaxis cohort. Baseline demographic and clinical characteristics are summarised in Table 1. Women in the IUGR cohort were slightly older, with a mean age of 30.9

Table 1. Baseline Maternal Characteristics and Aspirin Adherence

Cohort	N	Maternal Age (mean ± SD)	BMI (mean ± SD)	Nulliparous (%)	Initiation ≤16w (%)	Dose 75–150 mg (%)	Duration Completed (%)	Overall Adherence (%)	GA at Delivery (mean ± SD)	Birthweight (mean ± SD, g)
IUGR	75	30.9 ± 6.5	25.9 ± 3.9	24.0	77.3	100.0	74.7	58.7	36.9 ± 2.0	2857 ± 518
PET	65	28.2 ± 7.1	27.4 ± 5.3	43.1	83.1	100.0	63.1	52.3	36.7 ± 2.3	3000 ± 464

years (SD 6.5), compared to 28.2 years (SD 7.1) in the PET cohort. Maternal body mass index (BMI) was higher in the PET group (27.4 ± 5.3 kg/m²) than in the IUGR group (25.9 ± 3.9 kg/m²). The PET group also had a greater proportion of nulliparous women (43.1%) than the IUGR group (24.0%), suggesting a higher baseline susceptibility to hypertensive disorders of pregnancy.

Adherence patterns differed across domains. While adherence to the recommended dose of 75–150 mg aspirin was universal (100%) in both groups, fewer women adhered to early initiation and duration. Early initiation (≤16 weeks gestation) was achieved by 77.3% of women in the IUGR cohort and 83.1% in the PET cohort. Duration adherence—continuing therapy until at least 36 weeks or delivery—was recorded in 74.7% of the IUGR group and only 63.1% of the PET group. Combining all three domains, overall adherence was achieved in 58.7% of women in the IUGR cohort and 52.3% of those in the PET cohort. These findings are illustrated in Figure 1, which highlights duration adherence as the weakest component of overall compliance.

Maternal and Neonatal Outcomes

Primary maternal and neonatal outcomes are presented in Table 2 and illustrated in Figure 2. In the IUGR cohort, recurrent growth restriction occurred in 16 women (21.3%; 95% CI: 13.6–31.9). Fifteen infants (20.0%; 95% CI: 12.5–30.4) required admission to the NICU. In the PET cohort, 12 women (18.5%; 95% CI: 10.9–29.6) developed PET despite aspirin prophylaxis, and 19 infants (29.2%; 95% CI: 19.6–41.2) required NICU admission.

The PET cohort had a higher NICU admission rate compared to the IUGR group (29.2% vs 20.0%). Confidence intervals overlapped, but the trend suggests that PET carries a higher risk of neonatal morbidity even with aspirin use.

Birthweight and Gestational Age

Birthweight and gestational age outcomes were further stratified by adherence subgroup. As shown in Figure 3, in the IUGR cohort, infants of women adherent to aspirin across all domains had higher mean birthweights (2959 g, SD 484) compared to those of non-adherent women (2713 g, SD 552). This difference of 246 g, though modest, reached statistical significance (Welch's $t = -2.09$, $P = 0.041$) and may represent a clinically relevant improvement, as even small increases in birthweight can shift neonates out of the severely growth-restricted category.

In contrast, the PET cohort did not demonstrate significant differences in birthweight between adherent and non-adherent subgroups (3078 g vs 2914 g; $P = 0.158$). This suggests that aspirin adherence may exert a stronger protective effect in women at risk of IUGR than in those at risk of PET.

Table 2. Maternal and Neonatal Outcomes With 95% Confidence Intervals

Cohort	Outcome	n	N	Rate (%)	95% CI (low–high)
IUGR	Recurrent IUGR	16	75	21.3	13.6–31.9
IUGR	NICU admission	15	75	20.0	12.5–30.4
PET	PET developed	12	65	18.5	10.9–29.6
PET	NICU admission	19	65	29.2	19.6–41.2

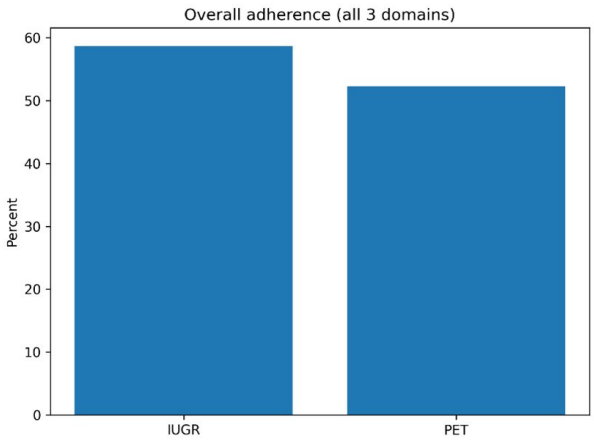

Figure 1. Overall Adherence to Aspirin Prophylaxis Across Initiation, Dose, and Duration in IUGR and PET Cohorts.

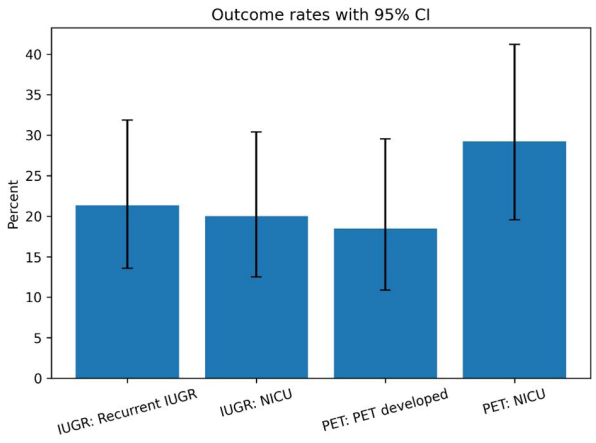

Figure 2. Maternal and Neonatal Outcomes (Recurrent IUGR, PET Development, NICU Admission) With 95% Confidence Intervals.

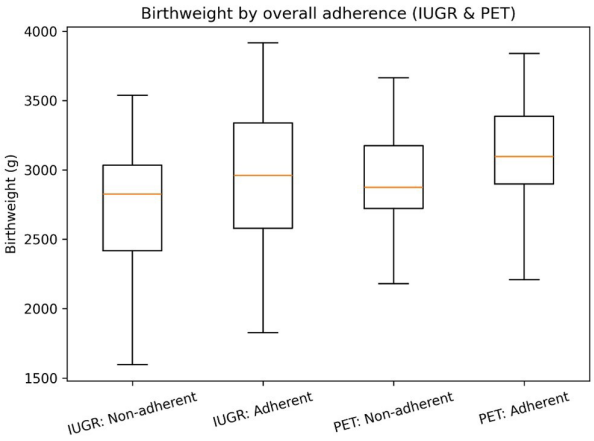

Figure 3. Birthweight Distributions by Overall Adherence Status in IUGR and PET Cohorts.

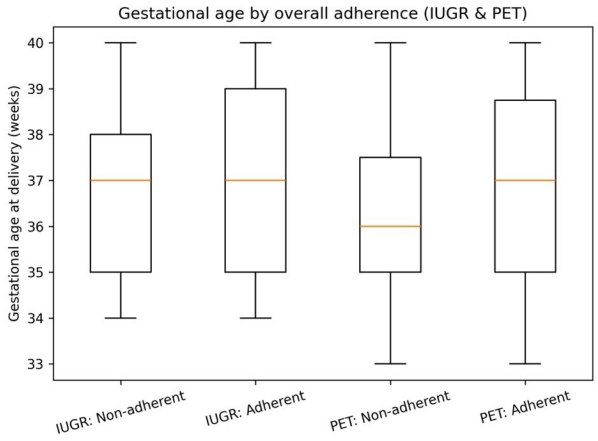

Figure 4. Gestational Age at Delivery by Overall Adherence Status in IUGR and PET Cohorts.

Gestational age outcomes are presented in Figure 4. Deliveries in both cohorts clustered around 37 weeks, with means of 36.9 weeks (SD 2.0) in the IUGR group and 36.7 weeks (SD 2.3) in the PET group. Stratification by adherence showed no meaningful differences, and Welch's t-tests confirmed non-significance (IUGR: $P = 0.499$; PET: $P = 0.331$).

Statistical Associations

Chi-square tests explored associations between adherence and categorical outcomes. In the IUGR cohort, no significant association was observed between overall adherence and recurrence of IUGR ($\chi^2 = 0.00$, df = 1, $P = 1.000$). Similarly, in the PET cohort, adherence was not significantly related to the development of PET ($\chi^2 = 0.25$, df = 1, $P = 0.619$). Welch's t-tests were performed for continuous outcomes. In the IUGR cohort, adherence was associated with higher mean birthweight, as noted above, but not with gestational age at delivery. In the PET cohort, neither birthweight nor gestational age differed significantly by adherence status. Together, these findings indicate that while aspirin adherence may not strongly influence the incidence of PET or recurrence of IUGR, it may confer modest but clinically meaningful improvements in neonatal growth among women at risk of IUGR.

Discussion

This study evaluated adherence to low-dose aspirin prophylaxis in two high-risk obstetric populations, women undergoing surveillance for IUGR and those at increased risk of PET and examined associated maternal and neonatal outcomes. Several important findings emerged. First, while adherence to the recommended aspirin dose was universal, adherence to early initiation and continuation until delivery was variable, with only around half of women meeting criteria for overall adherence. Second, recurrent IUGR and PET developed in a notable minority of cases despite aspirin use, underscoring the complexity of these conditions. Third, adherence was associated with a modest but statistically significant improvement in birthweight in the IUGR cohort, but not with gestational age at delivery or outcomes in the PET group.

Adherence to Aspirin Prophylaxis

We found that about 50% of women attained full compliance on the initiation, dose, and period domains of compliance, which agrees with audits that have been published before. According to a research study by Shanmugalingam et al, the pill burden, forgetfulness, and communication with health caregivers were among the influencing factors that influenced the adherence to aspirin prophylaxis among women at high risk of developing PET (15). Equally, UK and Ireland national audits have demonstrated high initiation rates and a reduction in duration adherence and thus indicated difficulties in maintaining therapy through the third trimester (31). The present results reinforce this pattern, identifying duration as the most vulnerable aspect of adherence. Clinical strategies to improve persistence, such as structured follow-up, counselling on long-term benefit, and integration into routine antenatal reminders, are warranted.

Maternal and Neonatal Outcomes

The recurrent IUGR rate of 21% observed here is broadly aligned with international cohort studies. The TRUFFLE trial (29) demonstrated similarly high recurrence and underscored the limitations of pharmacological prophylaxis alone. The rate of PET development in this audit (18%) mirrors figures reported in meta-analyses of high-risk populations, where aspirin has been shown to reduce but not eliminate risk (13). Notably, NICU admission rates were higher in the PET cohort (29%) compared with IUGR (20%), reflecting the broader systemic risks posed by hypertensive disorders.

The observed association between aspirin adherence and higher birthweight in the IUGR cohort is noteworthy. The 246 g difference, though modest, is clinically relevant, as even incremental gains in fetal growth may reduce perinatal morbidity. This aligns with the findings of Pels et al, who reported that improved placental perfusion from aspirin use translates into measurable improvements in growth trajectories, particularly when initiated early. However, the absence of a similar effect in the PET cohort suggests that aspirin's impact may be more pronounced in growth-mediated pathways than in hypertensive pathophysiology.

Gestational age outcomes were not significantly influenced by adherence. This finding echoes prior literature indicating that while aspirin can reduce the risk of early-onset PET or IUGR, it does not consistently prolong gestation (3). Thus, the clinical utility of aspirin may lie more in improving intrauterine conditions and fetal growth than in delaying delivery (32,33).

Clinical Implications

Several implications of the current findings to practice are presented. As a quality improvement audit, these findings are intended to guide service-level interventions and inform future re-audit cycles rather than establish causal effects. First, they point out that there is a need to have strong systems to facilitate duration adherence, which seems to be the most vulnerable part of prophylaxis. This may involve electronic reminders, formalized antenatal guidelines, and late-pregnancy specific reinforcement. Second, the evidence indicates that the effects of aspirin could be most significant in women with the risk of IUGR, which supports the recommendations in the guidelines, indicating the priority of prophylaxis in this population (RCOG34). Third, the concurrent occurrence of poor outcomes despite taking aspirin demonstrates the need to adopt all-inclusive surveillance measures. One should consider aspirin as one of the tools of the larger toolkit comprising serial growth scans, uterine artery Doppler, and early intervention in case it is needed (35, 36).

Strengths and Limitations

A strength of this study is its pragmatic, real-world audit design, which reflects clinical adherence patterns outside the context of tightly controlled trials. The inclusion of both IUGR and PET high-risk groups provides comparative insight into the variable effects of aspirin prophylaxis. The use of multiple outcome measures, including recurrence of disease, NICU admission, and continuous birth outcomes, allowed a nuanced assessment of clinical impact (37, 38). Several limitations should be acknowledged. Although adequate for descriptive purposes, the sample size limited the ability to detect small but clinically meaningful differences, and no formal power calculation was performed given the service evaluation design. Adherence was assessed using prescribing and follow-up records, which depend on documentation quality and may not fully reflect actual patient behaviour, including unreported discontinuation. Additionally, aspirin-related adverse events were not systematically captured and therefore could not be analysed. Finally, the absence of a non-aspirin comparator group limits causal inference, as outcomes may have been influenced by underlying maternal risk factors or concurrent interventions. Despite these limitations, the audit design aligns with international standards and provides a reproducible assessment of aspirin prophylaxis practice in high-risk pregnancies.

Comparison With Guidelines and Literature

Guideline recommendations, including those from the NICE (2019) and the RCOG (2019), advocate low-dose aspirin for women at high risk of PET or IUGR, ideally initiated before 16 weeks (12, RCOG34). The present findings confirm high uptake of initiation but highlight challenges with duration adherence. Compared with meta-analytic evidence demonstrating reductions in PET risk with aspirin adherence exceeding 60% (11), our overall adherence of ~55% suggests that real-world effectiveness may be lower than trial efficacy. This gap highlights the importance of implementation science in bridging guideline recommendations with clinical outcomes.

Future Directions

Future research should focus on strategies to improve long-term adherence, including patient education, digital adherence monitoring, and health-system level interventions. Larger multicentre audits could validate whether the birthweight benefits observed in the IUGR group are reproducible at scale (39). Furthermore, mechanistic studies could clarify whether aspirin exerts differential effects on placental development in IUGR versus PET pathophysiology.

Conclusions

This study examined adherence to low-dose aspirin prophylaxis in women at high risk of IUGR or PET and evaluated associated maternal and neonatal outcomes. Compliance with the recommended dose of aspirin was universal, although the starting date before 16 weeks and the continued use through to delivery was less consistent, which contributed to the overall level of compliance being over 50 per cent in both groups. These findings highlight that the principal challenge in clinical practice lies not in initiating aspirin prophylaxis, but in sustaining adherence through to the third trimester. The acquisition of regular IUGR and PET in a significant proportion of cases also occurred with the application of aspirin, and the complexity of these conditions and the ineffectiveness of pharmacological prophylaxis were pointed out. Notably, adherence was associated with a modest but potentially clinically relevant increase in birthweight in the IUGR cohort. Contrastingly, there was no significant difference

in gestational age at delivery or PET cohort, indicating that aspirin has different effects on pathophysiological processes.

These findings have the clinical implication that aspirin prevention remains a viable intervention, particularly in women with an elevated risk of IUGR, but must be integrated into a greater surveillance and control initiative. Powerful interventions to increase adherence -such as structured counselling, online prompts, and embedded pathways of antenatal care- are required to harness the guideline recommendations to feasible relevance. Future research must address this study by conducting multicentre audit validation of these findings on a broader scale, and implementation research to determine cost-effective measures to sustain compliance. Mechanistic trials can also help to understand why aspirin has greater growth restriction than hypertensive effects. Finally, to overcome the gap between trial efficacy and clinical effectiveness, both pharmacological and system-level maternal care approaches will be needed.

Authors' Contribution

Mohammad Mustafa Farooq Khan conceived and designed the study, performed data collection and statistical analysis, interpreted the findings, and drafted the manuscript. Saadia Ejaz provided critical review of the manuscript and approved the final version for publication.

Conflict of Interests

Authors declare that they have no conflict of interests.

Ethical Issues

Ethical approval was registered under "AQUA-2024-10-04" at The Coombe Hospital. All patient data were de-identified before analysis, and handling complied with General Data Protection Regulation (GDPR) standards.

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