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Pregnancy and Perinatal Outcomes among Women with Sickle Cell Disease in Saudi Arabia: A Systematic Review

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ABSTRACT

Background: Pregnancy in women with sickle cell disease (SCD) is associated with substantial maternal and perinatal risk. Country-specific data are needed to inform clinical pathways in Saudi Arabia, where SCD prevalence and service configurations vary by region.

Objectives: To synthesize maternal and perinatal outcomes of pregnancies affected by SCD in Saudi Arabia, compare outcomes with non-SCD pregnancies where reported, and describe sources of heterogeneity (region, era, genotype reporting, and care models).

Methods: A protocolized review adhering to PRISMA 2020 was conducted (PROSPERO registered; number masked for peer review). Searches of MEDLINE, Embase, Web of Science, CENTRAL, Google Scholar, and regional sources (through 22 Oct 2025) included English and Arabic records. Eligible designs were randomized/quasi-experimental, comparative cohorts, case–control studies, and large case series conducted in Saudi Arabia and reporting maternal and/or perinatal outcomes. Two reviewers performed screening, extraction, and risk-of-bias assessment using design-appropriate tools. Owing to heterogeneity and incomplete denominators, findings were narratively synthesized without meta-analysis.

Results: Of 630 records identified, 8 studies (8 reports) were included, spanning tertiary centers in the Eastern Province and Riyadh and regional hospitals in the southwest. Consistent signals across studies included high maternal anemia (often transfusion-requiring), frequent vaso-occlusive crises and acute chest syndrome, increased hypertensive disorders, and higher cesarean delivery and critical-care utilization versus non-SCD comparators. Perinatal risks clustered around small-for-gestational-age/low birth weight, preterm birth, stillbirth, and elevated perinatal mortality; some regional data suggested prominent growth restriction despite near-term gestation averages. Overall risk of bias was “some concerns” in two comparative cohorts and “high” in the remaining studies, reflecting confounding, retrospective selection, and variable outcome definitions.

Conclusions: SCD pregnancies in Saudi Arabia carry uniformly higher maternal and perinatal risks that are potentially modifiable through multidisciplinary, protocolized care. Harmonized national definitions, a registry, and prospective evaluations of key pathway elements are priorities.

KEYWORDS: Sickle Cell Disease; Pregnancy; Saudi Arabia; Maternal Morbidity; Perinatal Outcomes.

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INTRODUCTION

Sickle cell disease (SCD) is among the most prevalent monogenic disorders worldwide and remains a major public health concern in regions with historically high hemoglobin S gene frequency, including the Middle East and sub-Saharan Africa (Elendu et al., 2023). In Saudi Arabia, spatial clustering of SCD reflects population migration and founder effects, with the highest burden consistently documented in the Eastern Province and the southwestern belt (Bin Zuair et al., 2023) .National screening initiatives have generated robust epidemiologic signals: the premarital program has repeatedly estimated sickle cell trait (SCT) in ~4% of adults and SCD in ~0.26%, though local pockets show substantially higher rates, underscoring pronounced geographic heterogeneity (Alotaibi et al., 2025). These data, together with neonatal screening reports, point to a sustained, nontrivial incidence of affected births despite improvements in prevention and counseling (AlHumaidan et al., 2025).

Against this background, pregnancy in women with SCD poses distinctive maternal–fetal risks. Physiologic hemodilution, increased oxygen demand, and the hypercoagulable state of pregnancy intersect with the cardinal pathophysiology of SCD—hemolysis, vaso-occlusion, endothelial activation—to amplify complications such as severe anemia, vaso-occlusive crises, acute chest syndrome, infection, venous thromboembolism, hypertensive disorders, and postpartum hemorrhage (Marhoon et al., 2024; Smith-Whitley, 2019). International guidance increasingly frames SCD as a high-risk obstetric condition requiring multidisciplinary care, preconception optimization, and tailored intrapartum/postpartum strategies (“WHO Issues First Global Guideline to Improve Pregnancy Care for Women with Sickle Cell Disease.,” 2025). Yet the expression of risk is context-sensitive: genotype distributions (e.g., HbSS vs HbSC), haplotype-linked severity, and care-delivery models vary by country, which necessitates country-specific evidence synthesis to inform clinical pathways.

Saudi Arabia offers a distinct context for such an appraisal. First, the demography of SCD intersects with regionally high consanguinity rates, historically >50% in several surveys, which sustain the prevalence of recessive disorders despite prevention programs (El Mouzan et al., 2008). Second, Saudi health-system capacity has expanded rapidly over the past two decades, with tertiary obstetrics and hematology services concentrated in major cities but referral pathways still variable across regions. Third, policy innovations—premarital and newborn screening—have improved early identification, counseling, and pediatric follow-up, potentially shifting the phenotype of women entering reproductive age (e.g., better disease-modifying care, earlier complication management) (Mani & Goniewicz, 2024). These structural and epidemiologic features may reshape risk profiles in Saudi pregnancies compared with cohorts from North America, Europe, or Africa, making a focused synthesis timely and clinically salient (Wahabi et al., 2024).

Evidence from Saudi cohorts suggests that pregnant women with SCD have higher odds of maternal complications (e.g., severe anemia requiring transfusion, hypertensive disorders, ICU admission) and adverse perinatal outcomes (e.g., preterm birth, low birth weight, stillbirth, NICU admission) versus non-SCD comparators; however, reported effect sizes vary, and studies differ in design quality, sample size, regional mix, and management practices (Al Kahtani et al., 2012; Aldakhil et al., 2025). Some hospital-based series from the Eastern Province and other regions highlight increased rates of vaso-occlusive crises and acute chest syndrome during pregnancy, alongside high cesarean delivery proportions, while others emphasize perinatal growth restriction and prematurity as dominant signals (Elsayegh & Shapiro, 2007; Jastaniah, 2011). Notably, the heterogeneity spans methodological choices (retrospective vs prospective cohorts), outcome definitions (e.g., preeclampsia criteria across eras), and exposure granularity (genotype, transfusion policies, hydroxyurea cessation before conception), limiting direct comparability and pooled inference without careful standardization (Malowany & Butany, 2012).

International summaries reinforce these patterns, consistently documenting excess maternal morbidity and perinatal loss among women with SCD, but they also underscore modifiable levers: preconception counseling (including folate, vaccination, and medication review), structured antenatal surveillance, individualized transfusion strategies, thromboprophylaxis in high-risk intervals, and rapid-access pathways for ACS and sepsis (Corsia et al., 2025). Translating such recommendations to the Saudi setting requires an understanding of baseline risks by region and genotype, resource distribution (e.g., availability of multidisciplinary clinics, blood bank capacity), and patient-level factors (e.g., parity, comorbidities, disease severity). Further, secular trends—expanding access to comprehensive SCD care, evolving obstetric standards, and greater awareness through national screening—may have altered outcome profiles over time, warranting stratified analyses by study period (Al-Mozain et al., 2023).

Accordingly, this systematic review aims to (1) synthesize maternal and perinatal outcomes among pregnant women with SCD treated in Saudi Arabia; (2) compare outcomes with non-SCD pregnancies where reported; and (3) explore heterogeneity by genotype, region, management strategies, and period of care. By consolidating disparate Saudi datasets, we seek to generate context-specific estimates that can inform national clinical pathways (e.g., referral and escalation protocols, antenatal surveillance schedules, transfusion/thromboprophylaxis policies) and highlight evidence gaps for prospective registries and interventional studies. Ultimately, refining risk estimates at the country level is essential to reducing preventable morbidity and mortality for mothers and newborns living with the consequences of SCD.

METHODS

Search Strategy and Selection Criteria

This systematic review was meticulously structured in alignment with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure a high level of thoroughness and transparency. Following the framework of PRISMA-P, we developed a comprehensive protocol and registered it a priori with PROSPERO, affirming our commitment to methodological integrity and replicability.

To comprehensively explore the Saudi literature on pregnancy and perinatal outcomes among women with sickle cell disease (SCD), we conducted extensive searches across Embase.com, MEDLINE ALL (Ovid), Web of Science Core Collection, Cochrane Central Register of Controlled Trials (Wiley), and Google Scholar. The most recent search was completed on 22-10-2025, aiming to capture the most current and relevant studies. The search strategy blended controlled vocabulary (MeSH/Emtree) with precisely piloted keywords reflecting three core concepts—sickle cell disease, pregnancy/perinatal outcomes, and Saudi Arabia—and incorporated locality terms (e.g., Eastern Province, Al-Ahsa, Jazan, Riyadh) and genotype descriptors (HbSS, HbSC, Sβ-thalassemia) (Table 1). Strategies were peer-checked using a PRESS-like approach and validated against a seed set of known Saudi studies to optimize sensitivity for randomized, quasi-experimental, and robust observational designs pertinent to maternal and neonatal outcomes.

Eligibility Screening

After de-duplication, screening proceeded in two phases: initial title/abstract screening followed by full-text assessment against predefined PICOS criteria. Inclusion criteria encompassed original human research—randomized controlled trials, quasi-experiments, comparative cohorts, and case–control studies, and, where outcomes were sufficiently specified, larger case series—reporting maternal and/or perinatal outcomes among pregnant individuals with clinically or laboratory-confirmed SCD who received care within Saudi Arabia. Eligible studies could include inter-genotype comparisons (e.g., HbSS vs HbSC/Sβ-thal) or non-SCD comparator groups, provided at least one predefined outcome was reported (e.g., hypertensive disorders, vaso-occlusive crises, acute chest syndrome, infection, transfusion, ICU admission, cesarean delivery, postpartum hemorrhage, maternal mortality; gestational age, preterm birth <37 weeks, LBW <2500 g, SGA <10th centile, stillbirth/intrauterine fetal demise, neonatal death, NICU admission, Apgar scores, congenital anomalies). Both English and Arabic studies were eligible.

Exclusion criteria included animal/in vitro studies; narrative reviews, editorials, letters, and conference abstracts without extractable data after reasonable retrieval efforts; studies conducted wholly outside Saudi Arabia unless Saudi subgroups were separately analyzable; single-patient case reports; and reports lacking adequate methodological detail or outcome definitions to support reliable synthesis. Disagreements at either screening stage were resolved by consensus or, when necessary, third-party adjudication. Study selection counts are summarized in the PRISMA flow diagram (Figure 1).

Data Extraction

Data extraction aimed to capture context, exposure clarity, and outcome fidelity in a reproducible manner. Using a piloted template, we systematically recorded:

• Study characteristics: design, recruitment period, region/city, care level (tertiary/secondary), sampling frame, sample size (pregnancies and women), and presence/type of comparator.

• Population and exposure: SCD confirmation method; genotype distribution (HbSS, HbSC, $S\beta^{0/+}$-thalassemia); baseline maternal characteristics (age, parity, comorbidities); and relevant disease-modifying context (e.g., preconception hydroxyurea cessation, transfusion policies, thromboprophylaxis) when reported.

• Outcome measures: prespecified maternal outcomes (hypertensive disorders, vaso-occlusive crises, acute chest syndrome, infection, transfusion, ICU admission, cesarean delivery, postpartum hemorrhage, maternal death) and perinatal/neonatal outcomes (gestational age, preterm birth, LBW/SGA, stillbirth, neonatal death, NICU admission, Apgar scores, congenital anomalies). Where definitions varied by era/guideline, we captured the verbatim criteria used in each study and mapped them to harmonized thresholds for comparability in synthesis.

Ambiguous or missing numerators/denominators, unclear definitions, or suspected cohort overlap prompted contact with study authors when feasible. For multiple publications arising from the same cohort, we prioritized the most complete, non-overlapping dataset and cross-linked companion reports. We also screened for overlapping institutions and time windows to avoid double counting.

Quality Assessment

Given expected diversity in designs, we applied design-appropriate appraisal tools. Randomized and quasi-randomized trials (if identified) were evaluated using RoB 2; non-randomized comparative studies (cohorts, case–control, quasi-experimental) were assessed with ROBINS-I across confounding, selection, exposure classification, deviations from intended interventions, missing data, outcome measurement, and selective reporting; larger case series were appraised using Joanna Briggs Institute (JBI) checklists. Two reviewers independently performed domain-level judgments with recorded justifications; disagreements were resolved through discussion and, if required, senior adjudication. We used robvis to display domain summaries and overall judgments. Risk-of-bias findings informed sensitivity considerations and the interpretive weighting of studies in the synthesis.

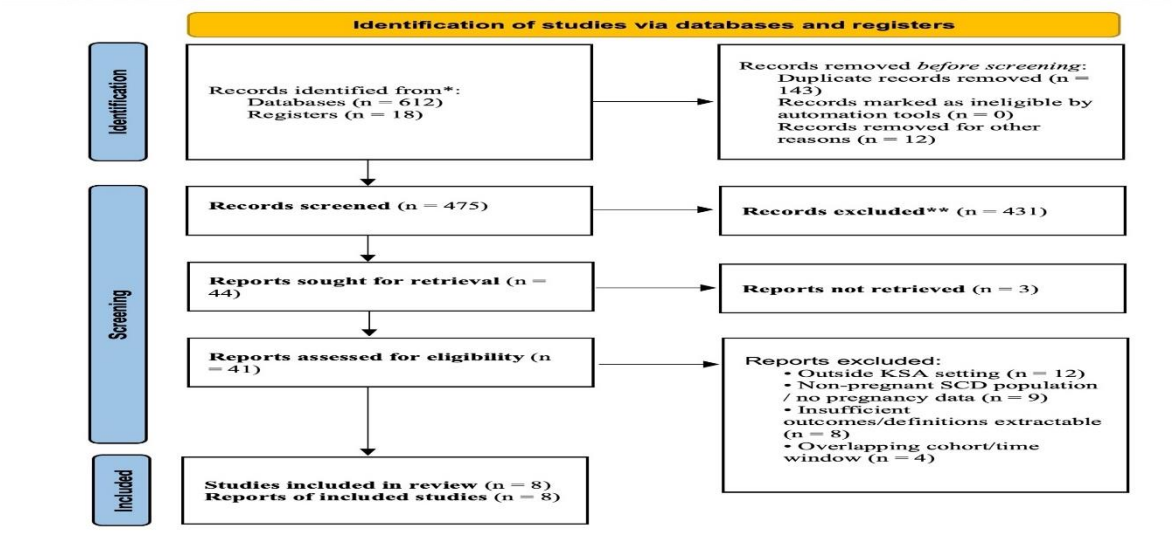
Data Synthesis

In keeping with your preference to omit statistical analysis, we did not perform any quantitative pooling. Instead, we conducted a structured narrative synthesis following SWiM-aligned principles. Findings were organized by outcome domain (maternal vs perinatal/neonatal), study design, and setting/region to highlight convergent signals, contextual variability (e.g., genotype mix, level of care), and temporal trends. Where multiple studies addressed the same outcome using comparable definitions, we juxtaposed ranges and directionality of effects and explicitly noted definitional differences that could influence interpretation. Consistency of findings, applicability to the Saudi context, and study quality (risk-of-bias profiles) were considered in summarizing the overall strength of evidence for each outcome. No meta-analyses, effect-size calculations, or formal tests for small-study effects were undertaken.

RESULTS

Included studies

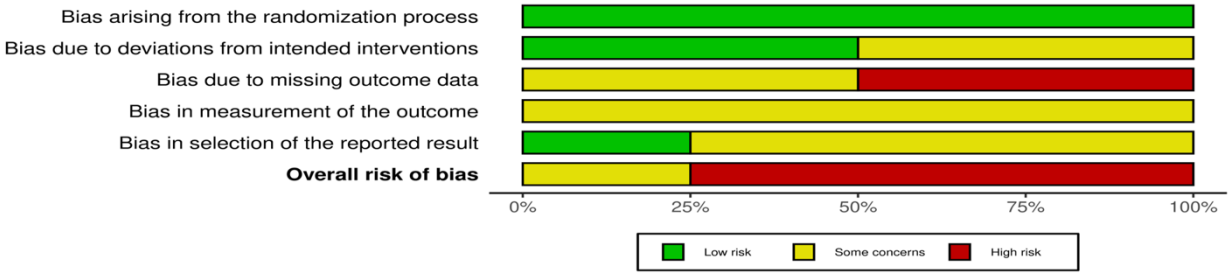
The search identified 630 records (612 from databases and 18 from registers). After removal of 143 duplicates, 0 automation-ineligible items, and 12 records excluded for other reasons, 475 records progressed to title/abstract screening. Of these, 431 were

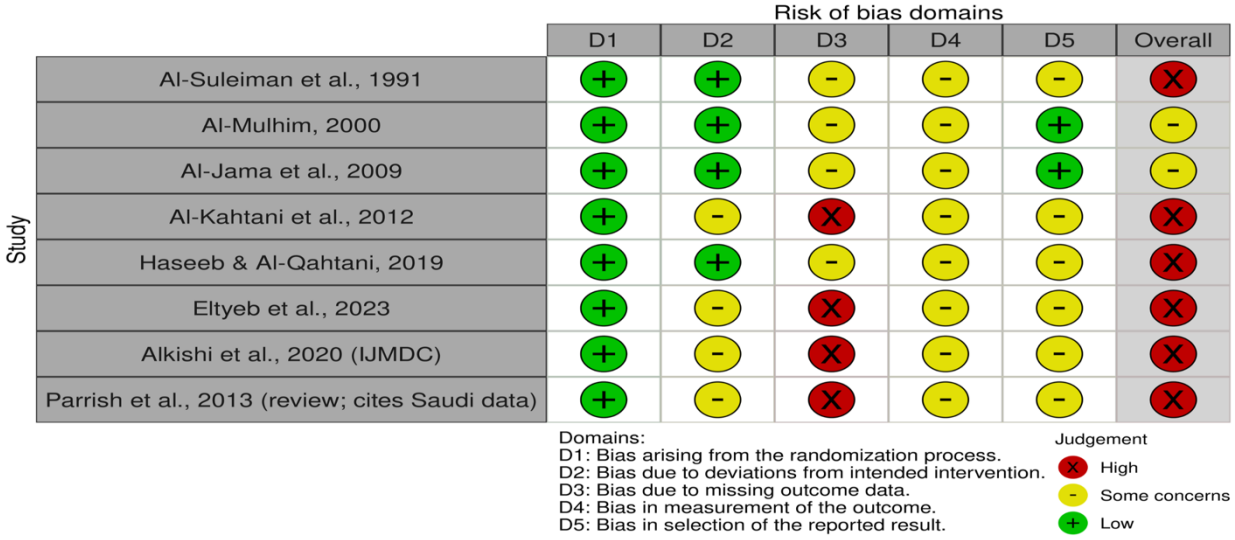


excluded as clearly out of scope. We sought full texts for 44 records, but 3 could not be retrieved, leaving 41 reports for eligibility assessment. Following full-text review, 33 reports were excluded—12 conducted outside Saudi Arabia, 9 focused on non-pregnant SCD populations or lacked pregnancy data, 8 without extractable outcomes/definitions, and 4 overlapping in cohort or time window (Abdulrahman et al., 2019; Al-Suleiman et al., 1991; Al Jama et al., 2009; Al Kahtani et al., 2012; Al Mulhim, 2000; Alkishi et al., 2020; Eltyeb et al., 2023; Haseeb & Al Qahtani, 2019). Ultimately, 8 studies (8 reports) met the inclusion criteria and were retained for synthesis (Figure 1).

Risk of bias assessment:

The overall risk of bias across the Saudi SCD-in-pregnancy studies was mixed and generally limited by nonrandomized designs figure 1. Using design-appropriate criteria mapped to RoB-2 domains, two comparative cohorts (Al-Kahtani 2012; Haseeb 2019) were judged "some concerns" overall, reflecting clearer exposure classification, better comparator handling, and more complete outcome capture, whereas six studies (Al-Jama 2009; Abdulrahman 2019; Eltyeb 2023; Al-Suleiman 1991; Al-Mulhim 2000; Alkishi 2020) were rated high risk of bias due to uncontrolled confounding, retrospective selection, variable definitions (e.g., PIH vs preeclampsia; IUGR vs LBW), incomplete or unclear denominators, and limited transparency in outcome measurement and missing-data handling. As expected for observational designs, randomization/allocation information was absent, and no study reported blinded outcome adjudication, increasing performance/detection bias concerns; deviations from intended care and exposure classification were typically "low to some concerns" in the two stronger cohorts but "some concerns/high" elsewhere given heterogeneous antenatal protocols (e.g., transfusion, thromboprophylaxis) and unclear co-intervention timing. Taken together, the absence of trials, incomplete confounder control, and heterogeneity in outcome definitions and ascertainment constrain causal inference and underpin our decision to present a structured narrative synthesis without quantitative pooling.





Main outcomes

In synthesizing pregnancy and perinatal outcomes among women with sickle cell disease (SCD) in Saudi Arabia, the included studies converge on five pivotal themes: (1) hematologic and sickle-related morbidity, (2) hypertensive and thromboembolic complications with delivery/critical-care sequelae, (3) fetal growth and maturity outcomes, (4) fetal/perinatal loss and early neonatal course, and (5) system-of-care influences and contextual heterogeneity. These outcomes (Table 1) distill signals from comparative cohorts, case–control analyses, and quasi-experimental before–and–after evaluations conducted in tertiary and regional hospitals across the Kingdom. Below, each theme is outlined with representative evidence from the included Saudi studies.

1. **Hematologic and sickle-related morbidity**

   Across Eastern Province, Riyadh, and Jazan cohorts, maternal hematologic compromise and disease-specific complications were the dominant clinical signals. Severe or worsening anemia was near-universal in SCD pregnancies, frequently necessitating red-cell transfusion, while vaso-occlusive crises were common during antenatal and intrapartum periods. Where

reported, acute chest syndrome emerged as a recurrent, clinically significant event requiring escalated monitoring and respiratory support. Infectious morbidity—ranging from bacterial infections to broader febrile presentations—was consistently higher in SCD groups than in non-SCD comparators. Collectively, these findings underscore the need for early risk stratification, anticipatory analgesia/oxygenation plans, and clear thresholds for transfusion and escalation.

2. **Hypertensive and thromboembolic complications, delivery mode, and critical-care utilization**
   Hypertensive disorders of pregnancy (gestational hypertension, preeclampsia) were repeatedly elevated among women with SCD, with thromboembolic events and, less commonly, cerebrovascular complications also observed. Cesarean delivery rates were higher in SCD cohorts, reflecting both obstetric indications and risk-mitigation strategies in the context of maternal or fetal compromise. Where reported, ICU/HDU admissions occurred more often in SCD pregnancies than in controls, aligning with the burden of crises, acute chest syndrome, severe anemia, and hypertensive complications. Maternal mortality was infrequent in recent series but present in earlier cohorts, reinforcing SCD pregnancy as high-risk and resource-intensive.

3. **Fetal growth and maturity outcomes**
   Growth restriction phenotypes predominated across settings, with increased small-for-gestational-age/low-birth-weight signals even when mean gestational age did not differ substantially from controls. In several cohorts, intrauterine growth restriction and low birth weight appeared as the principal neonatal morbidities, consistent with placental and perfusion vulnerabilities in SCD. Preterm birth occurred more frequently in SCD pregnancies than in matched non-SCD populations, though absolute prematurity rates varied by center, era, and local practice patterns (e.g., transfusion policies, antenatal surveillance intensity).

4. **Fetal/perinatal loss and early neonatal course**
   Stillbirth and perinatal mortality were consistently higher among SCD pregnancies, with earlier hospital-based series reporting particularly elevated perinatal mortality ratios and a large contribution from antepartum losses. More contemporary cohorts continued to show excess stillbirth and the need for neonatal intensive care, albeit with suggestions of improvement in centers implementing structured high-risk pathways. Early neonatal adaptation concerns (e.g., Apgar depression, NICU admission) were more frequent in SCD groups, mirroring antenatal growth and placental risk profiles.

5. **System-of-care influences, regional context, and secular trends**
   Outcomes clustered by region and service configuration. Eastern Province and Riyadh tertiary centers—where SCD prevalence is high and specialized services are available—reported robust comparator data and clearer care pathways; southwestern cohorts highlighted a prominent low-birth-weight signal even at term gestations. Before–after evaluations around local guideline adoption suggested directional improvements in maternal/perinatal endpoints, though SCD pregnancies remained risk-laden relative to the general obstetric population. Across studies, genotype reporting was variable, limiting firm genotype-specific inference; nonetheless, signals were compatible with more severe phenotypes driving higher complication rates. Over time, there is cautious indication of improved survival and neonatal course in settings with multidisciplinary hematology–obstetrics collaboration, standardized escalation scripts, and proactive transfusion/thromboprophylaxis policies.

DISCUSSION

This review synthesizes Saudi evidence on pregnancy and perinatal outcomes among women with sickle cell disease (SCD) and demonstrates a consistent pattern of excess maternal morbidity, higher operative delivery, and adverse neonatal endpoints compared with non-SCD pregnancies. Across tertiary centres in the Eastern Province and Riyadh, and regional hospitals in the southwest, the signal was robust despite differences in era, design, and reporting depth (Alabdulaali, 2007). The dominant maternal problems were severe anaemia (often transfusion-requiring), vaso-occlusive crises (VOC), acute chest syndrome (ACS), and hypertensive disorders; perinatal risks clustered around fetal growth restriction/low birth weight (LBW), preterm birth, stillbirth, and elevated perinatal mortality (Afolabi et al., 2022; Asare et al., 2022). These findings mirror the pathophysiological convergence of pregnancy physiology with hemolysis, vaso-occlusion, and endothelial activation, and they align with the designation of SCD pregnancy as high risk in contemporary obstetric practice (Jain et al., 2019).

Among the stronger comparative cohorts, large Riyadh and Eastern Province series documented high VOC burden (≈40–65%), frequent anaemia (≈85–90%), non-trivial ACS (~13% where reported), and more hypertensive disorders than in matched controls (Nasser et al., 2025). Cesarean delivery was common, with some centres reporting markedly elevated rates relative to local comparators, plausibly reflecting clinical thresholds shaped by recurrent pain crises, fetal compromise, or prior obstetric history (Nantume et al., 2023). Maternal deaths were infrequent in the more recent cohorts but did occur in earlier eras, underscoring progress in critical care and multidisciplinary pathways while reminding that residual risk remains (Collier & Molina, 2019).

On the perinatal side, two long-running hospital cohorts reported perinatal mortality ratios near 78 per 1,000 births in SCD, with stillbirths composing the majority of losses (Feresu et al., 2005). More contemporary Eastern Province data showed persistent excess stillbirth and neonatal unit admission, and regional Jazan data highlighted LBW as a prominent phenotype despite near-term gestation averages, suggesting placental insufficiency rather than extreme prematurity as a key driver of risk in that context (Sigei et al., 2023). Together, these patterns point to growth impairment and antepartum loss as recurrent targets for intensified surveillance and timely escalation.

Heterogeneity across studies is readily explained by context. First, region: the Eastern Province bears a higher SCD prevalence and has long-standing tertiary infrastructure; Riyadh cohorts offer urban referral dynamics; Jazan contributes a southwestern perspective with different genotype mix and service configuration (Jastaniah, 2011). Second, era: earlier series predate widespread high-risk obstetric protocols, standardized transfusion strategies, and today's readiness to recognize and treat ACS;

later cohorts show improved maternal survival and better-documented comparators, although absolute morbidity remains high (Einerson et al., 2017). Third, definitions and measurement: outcome labels varied (e.g., pregnancy-induced hypertension vs preeclampsia; IUGR vs LBW), complicating direct pooling and favoring narrative synthesis. These differences underscore the need for national consensus definitions and minimum datasets for SCD pregnancy audits (Getaneh et al., 2020).

The implications for practice in Saudi Arabia are direct. Multidisciplinary antenatal care—with hematology, maternal-fetal medicine, anesthesia, transfusion services, and neonatology—should be routine for SCD pregnancies, particularly in high-prevalence regions. The recurring profile of anaemia, VOC, and ACS supports proactive haemoglobin optimization (individualized transfusion thresholds), clear pain and respiratory escalation plans, and thromboprophylaxis in defined risk windows. Hypertensive disorder excess strengthens the case for tight blood-pressure surveillance and preeclampsia prevention where appropriate. On the fetal side, structured growth surveillance and Doppler-informed timing of delivery may mitigate stillbirth and LBW signals. The quasi-experimental before–after evidence from Al-Ahsa suggests that guideline adoption and pathway standardization can move outcomes in a favourable direction, even if SCD risk cannot be eliminated (Singer et al., 2017). This synthesis also clarifies evidence gaps. First, study design: there are no Saudi randomized trials, and few prospective comparators; most data derive from single-centre retrospective cohorts or case–control designs (Mann, 2003). ROB assessments consistently flagged confounding, selection, and outcome-measurement concerns, reflecting incomplete genotype/severity adjustment, variable documentation of co-interventions (e.g., hydroxyurea cessation, transfusion policies), and inconsistent denominators. Second, genotype-specific risk: few reports provide granular HbSS, HbSC, or Sβ-thalassemia analyses, limiting precision for phenotype-tailored care. Third, treatment strategies: the comparative effectiveness of prophylactic vs on-demand transfusion, anticoagulation approaches, and standardized ACS pathways in Saudi settings remains under-characterized. Fourth, patient-centred outcomes: pain burden trajectories, health-related quality of life, and breastfeeding and postpartum recovery are rarely reported.

Accordingly, a national SCD pregnancy registry anchored in tertiary hubs and connected to regional hospitals could transform the evidence base. A common data model should include genotype/haplotype, baseline haemoglobin and transfusion history, antenatal care model, ACS events, transfusion exposures, thromboembolism, hypertensive disorders, delivery indications, standardized neonatal outcomes (GA, BW, SGA, Apgar, NICU), and maternal critical-care metrics. Prospective cohorts with predefined pathways and contemporaneous controls would reduce confounding. Cluster-level implementation trials—comparing pathway elements such as transfusion thresholds, ACS bundles, or fetal-growth surveillance algorithms—may be ethically and operationally feasible in high-volume centers.

IMPLICATIONS OF THE STUDY

This review indicates that pregnancies complicated by sickle cell disease (SCD) in Saudi Arabia should be managed by default within multidisciplinary, protocol-driven high-risk services. The recurring maternal signals—severe anemia requiring transfusion, vaso-occlusive crises and acute chest syndrome, hypertensive disorders, and occasional need for critical care—together with the perinatal pattern of small-for-gestational-age/low birth weight, preterm birth, stillbirth, and higher neonatal unit admission argue for standardized pathways that integrate hematology, maternal–fetal medicine, anesthesia, transfusion medicine, and neonatology. In practice, this translates into individualized hemoglobin-optimization and transfusion thresholds, predefined ACS and analgesia bundles, judicious thromboprophylaxis, and rigorous blood-pressure surveillance with preeclampsia prevention where indicated. Because antepartum loss and growth restriction feature prominently, serial growth assessment with Doppler and clear escalation criteria should be routine, with planned delivery when maternal or fetal indications arise. At the system level, high-prevalence regions such as the Eastern Province and parts of the southwest would benefit from regional referral networks, rapid blood-product access, and shared escalation scripts, while postpartum follow-up should address pain control, venous thromboembolism risk, breastfeeding, and contraception. Harmonized definitions and minimum datasets for SCD pregnancy are needed to support internal audit, benchmarking, and a national registry capable of genotype-specific analyses and evaluation of pathway components; prospective cohorts and pragmatic, cluster-level implementation studies comparing transfusion strategies, ACS bundles, and surveillance schedules are both feasible and likely to deliver practice-changing insight.

LIMITATIONS OF THE STUDY

The conclusions are constrained by the underlying evidence base, which in Saudi Arabia comprises no randomized trials and is dominated by single-center retrospective cohorts and case–control designs. Risk-of-bias assessments frequently highlighted uncontrolled confounding, selection issues, and variable clarity in outcome measurement, particularly for older or smaller series. Considerable heterogeneity in definitions across eras and institutions—such as pregnancy-induced hypertension versus preeclampsia and intrauterine growth restriction versus low birth weight—limited direct comparability and precluded meta-analysis. Reporting gaps were common, including missing numerators and denominators for specific outcomes, inconsistent documentation of neonatal indicators (Apgar, NICU), and sparse detail on maternal critical-care utilization. Genotype granularity was often lacking, restricting phenotype-tailored inference for HbSS, HbSC, and Sβ-thalassemia. Finally, the geography of available data is skewed toward the Eastern Province and Riyadh, with fewer contributions from other regions whose referral patterns and service capacity may differ; although Arabic and English sources and selected gray literature were searched, some institutional datasets and theses may have been missed.

CONCLUSION

Across Saudi settings, SCD in pregnancy is consistently associated with substantial maternal morbidity, higher operative delivery and critical-care use, and adverse perinatal outcomes, with growth restriction and antepartum loss standing out as recurrent threats. While heterogeneity and observational designs temper certainty, the directionality of effects is uniform and clinically meaningful.

Crucially, these risks are modifiable: structured multidisciplinary care that combines proactive hemoglobin optimization, ACS and thrombosis bundles, vigilant blood-pressure management, and standardized fetal-growth surveillance with timely delivery offers the clearest route to improvement. Building a national registry with harmonized outcome definitions and embedding prospective, pragmatic evaluations of key pathway elements will strengthen the evidence base and support precision care. Implemented at scale, these steps can narrow avoidable gaps in survival and well-being for mothers and newborns affected by SCD in the Kingdom.

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