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ORIGINAL ARTICLE

Pregnancy outcomes in survivors of hematological malignancies: A systematic review with meta-analysis of thirty-seven cohort studies

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ABSTRACT

Background: Reproductive outcomes in survivors of hematological malignancies (HM) are of growing concern, yet evidence from large-scale comparative studies has not been comprehensively synthesized. This systematic review and meta-analysis aimed to assess the impact of a history of HM on pregnancy outcomes. **Methods:** We searched three databases (inception to Jan 1, 2026) for cohort studies comparing HM survivors with population/sibling controls. Random-effects meta-analysis pooled relative risks (RRs) with 95% CIs; subgroup, meta-regression, sensitivity, and publication bias analyses were performed. **Results:** Thirty-seven cohort studies were included. Compared with controls, HM survivors had significantly lower rates of pregnancy (relative risk [RR] 0.67, 95% CI: 0.49-0.92) and live birth (RR 0.69, 95% CI: 0.59-0.79). The risks of preterm birth (RR 1.39, 95% CI: 1.24-1.55), low birth weight (RR 1.29, 95% CI: 1.06-1.57), cesarean section (RR 1.23, 95% CI: 1.13-1.35), and gestational diabetes mellitus (GDM; RR 1.27, 95% CI: 1.01-1.58) were significantly elevated. No statistically significant associations were observed for spontaneous abortion, induced abortion, stillbirth, small for gestational age, birth defects, or hypertensive disorders of pregnancy in the main analyses. Subgroup analyses suggested that the risks of preterm birth and low birth weight were more pronounced among leukemia survivors, while lymphoma survivors showed a significantly increased risk of stillbirth. **Conclusion:** A history of HM is associated with multiple adverse pregnancy outcomes and reduced pregnancy/live birth rates, underscoring the need for targeted oncofertility counseling and reproductive surveillance in this population.

Keywords: cohort study, hematologic malignancy, meta-analysis, fertility counseling, pregnancy outcomes

INTRODUCTION

Hematologic malignancies (HM) are malignant clonal proliferative diseases caused by impaired differentiation and development of hematopoietic stem cells, mainly including acute and chronic leukemia and lymphoma. In the United States, leukemia is the most common cancer in childhood, accounting for 28% of cases, and lymphoma is the second most common cancer in adolescence, accounting for 19% of cases. Although the incidence of HM is increasing, gains in survival have been rapid for HM because of the innovation in therapeutic strategies, resulting in a substantial proportion of patients reaching childbearing age.[1,2] Moreover, given

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the rising trend of delaying pregnancy to later in life, more people are diagnosed with HM before completing their families.[3] For this reason, fertility and pregnancy-related issues are particularly noteworthy among survivors, and are considered one of the important priorities in cancer care in the 21st century.[4] The question of whether the history of HM is associated with poor pregnancy outcomes has generated considerable interest from both a clinical and research perspectives. In addition, many cancer survivors have concerns about the risk of infertility and the health of future biological children.[5] Nevertheless, cancer survivors have a similar desire to become pregnant compared with the general population and are more likely to seek consultation with reproductive specialists.[6] Previous studies have provided evidence that cancer survivors who received fertility counseling had a higher probability of pregnancy than those who did not.[7] Consequently, oncofertility counseling is necessary to support cancer patients in making decisions about future pregnancies and births.[8]

Quantification of the risks associated with pregnancy in individuals with a history of HM is essential for appropriate counseling and provision of care. Numerous observational studies have demonstrated that the diagnosis of HM before pregnancy might result in a broad spectrum of perinatal and birth outcomes, such as preterm birth, low birth weight (LBW) and small for gestational age (SGA).[9,10] These risks have not been well recognized, and the magnitude of the association has varied across studies. For example, an increased risk of induced abortion was reported for lymphoma survivors in the United States Childhood Cancer Survivors Study,[9] which was inconsistent with the findings in the Danish Childhood Cancer Survivors Study and other large populations.[10–12] Individually, these reports, usually from single-center studies, provide valuable data for a given population, limiting their generalizability to a more diverse population. Additionally, two systematic reviews and meta-analyses estimated a limited number of pregnancy outcomes of HM survivors who received bone marrow transplantation or Hodgkin lymphoma (HL) survivors using proportion data.[13,14] However, several recent cohort studies with large sample sizes were not included in these systematic reviews, which might limit the quality of evidence and robustness of conclusions.

To our knowledge, the impact of HM on pregnancy outcomes has been a subject of controversy. Therefore, we conducted a systematic review and meta-analysis of cohort studies to provide precise estimates of the association between the history of HM and pregnancy outcomes.

METHODS

Protocol registration and study design

This systematic review and meta-analysis was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and Meta-analysis of Observational Studies in Epidemiology (MOOSE) guidelines (Supplementary Tables 1-2).[15,16] A detailed internal protocol was developed prior to data extraction; however, the study was not registered in PROSPERO.

Literature search

We performed a systematic literature search in the PubMed, Cochrane, and Web of Science databases from inception to January 1, 2026, restricting our query to the studies published in English. Searches of the electronic databases were supplemented by hand-searching the reference lists of included studies for further potentially pertinent publications. Supplementary Table 3 summarizes the detailed search strategy.

Selection criteria

Studies were eligible for inclusion if they met the following population, intervention or exposure, comparison, outcome, study design (PICOS) criteria: (1) population: females of all age groups; (2) intervention/exposure: participants previously diagnosed with HM as an exposed group; (3) comparison: general population or siblings as a comparison group; (4) outcome: reporting the risk of subsequent pregnancy outcomes; (5) study design: cohort study; and (6) available information for estimated effect values or necessary raw data presented in the articles to calculate these according to the analyzed outcome. If multiple publications reported similar pregnancy outcomes from the same study sample were available, priority was given to the publication with more endpoint events, the largest sample size, the latest research, or longer follow-up times in that order.[17,18]

The following studies were excluded: (1) editorials, case reports, reviews, and other non-cohort studies; (2) patients with HM after or during pregnancy; (3) pregnancy through assisted reproductive technology; and (4) fewer than 3 studies available for a particular outcome.

Study selection

Two reviewers independently assessed each study using predetermined inclusion and exclusion criteria. A third reviewer was available to resolve any conflicts. An initial screen of titles and abstracts was performed, followed by a thorough full-text analysis.

Data abstraction

Two reviewers independently extracted variables from

the eligible literature by using a prespecified data extraction form. The form information included the first author, publication year, country, factors that were matched for study design or adjusted for data analysis, type of HM, sex of the person diagnosed with HM, pregnancy outcomes, number of HM survivors and controls, estimates effect values including relative risk (RR), hazard ratio (HR), and odds ratio (OR), and 95% confidence intervals (CIs). Corresponding authors were contacted directly by email for any missing data. If more than one estimate was reported, the estimate with the most adjusted covariates had priority;[19] if risk estimates were unavailable, we calculated corresponding estimates and 95% CIs using the raw data of the study. Any discrepancies were resolved through discussion or consulting a third reviewer to reach a consensus.

The following pregnancy outcomes were assessed: (1) Reproductive outcomes: the likelihood of pregnancy, live birth, and delivery. (2) Model of delivery: cesarean section. (3) Adverse pregnancy outcomes: spontaneous abortion, induced abortion, stillbirth (fetal death in utero at or after 22 weeks of gestation or at a weight of more than 500 g), preterm birth (< 37 weeks gestation), LBW (< 2500 g), SGA (birth weight below the 10th percentile or 2 standard deviations of mean weight for gestational age), and birth defects.

(4) Pregnancy complications: gestational diabetes mellitus (GDM) and hypertensive disorders of pregnancy (gestational hypertension, preeclampsia, and eclampsia).

Primary analyses for pregnancy-related outcomes (*e.g.*, GDM, cesarean section, preterm birth, LBW) were restricted to female HM survivors. Sensitivity analyses were performed excluding studies that included male participants to verify the robustness of the results.

Risk-of-bias assessment

The methodological quality of all included literature was assessed using the Newcastle-Ottawa Scale (NOS) by two reviewers independently.[20] The NOS uses a "star system", in which stars are assigned to show higher quality on the bias of the following three prespecified criteria: risk of bias in the selection, comparability of cohorts, and ascertainment of the outcomes. These studies with full marks in at least two categories of selection, comparability, or outcome assessment were deemed to have a low risk of bias.[21] The conflicts were discussed or consulted by a third reviewer and subsequently resolved by consensus.

Data analysis

Given the expected clinical and methodological heterogeneity across studies, random-effects models were prespecified as the primary analytic approach for all outcomes, irrespective of the magnitude of observed I-squared (I^2). The RRs and their 95% CIs, as measures of the association between a history of HM and pregnancy outcomes, were calculated accordingly. For studies that reported separate risk estimates for subgroups (for example, different age groups and types of HM), we first used the random-effects model to generate overall study-level relative risks.[22] Heterogeneity across studies was evaluated using the I^2. Egger's test was used to assess the possibility of publication bias. For outcomes with fewer than 10 included studies, Egger's test has limited statistical power, and a non-significant result does not exclude the presence of small-study effects. This limitation is explicitly acknowledged in the Discussion section. Sensitivity analysis was conducted by omitting individual studies one by one and recalculating the pooled effect size estimates for the remaining studies to explore whether the results were strongly influenced by a particular study.[23]

We undertook subgroup analyses based on the following factors: type of HM (leukemia or lymphoma), type of lymphoma (HL or non-Hodgkin's lymphoma [NHL]), age at cancer onset (childhood-onset or adult-onset), and treatment era (early era, middle/mixed Era, or recent era). Subgroup analyses were only performed if more than two studies were available for each subgroup.[24] Furthermore, the differences in these characteristics were determined through meta-regression analysis.

We used the Stata software (version 14.0) to analyze data and considered a two-sided *P* value less than 0.05 as being statistically significant.

RESULTS

Study selection and characteristics of eligible studies

A total of 29,025 non-duplicate potentially relevant records were identified. Of these, 128 abstracts were selected for detailed assessment, and after a review of the full-text articles, 37 cohort studies were included in the present study (Figure 1).[9–12,25–57]

Risk-of-bias assessment

The quality assessment of the included studies was summarized in Supplementary Table 6. NOS scores ranged from 5 to 9 with a median score of 7. Out of 37 cohort studies, 34 studies were at low risk of bias, whereas 3 studies were at high risk of bias.

Reproductive outcomes

Six studies reported pregnancy outcomes and ten reported live birth outcomes among HM survivors. Random-effects meta-analyses showed that HM

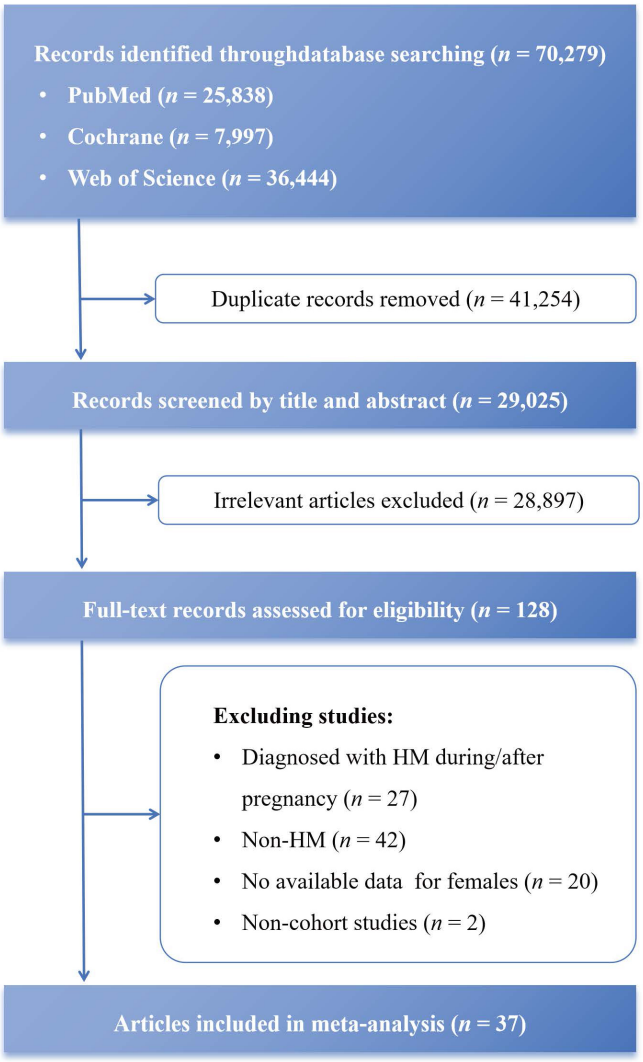

Figure 1. Flowchart for literature search and screening. HM, hematologic malignancy.

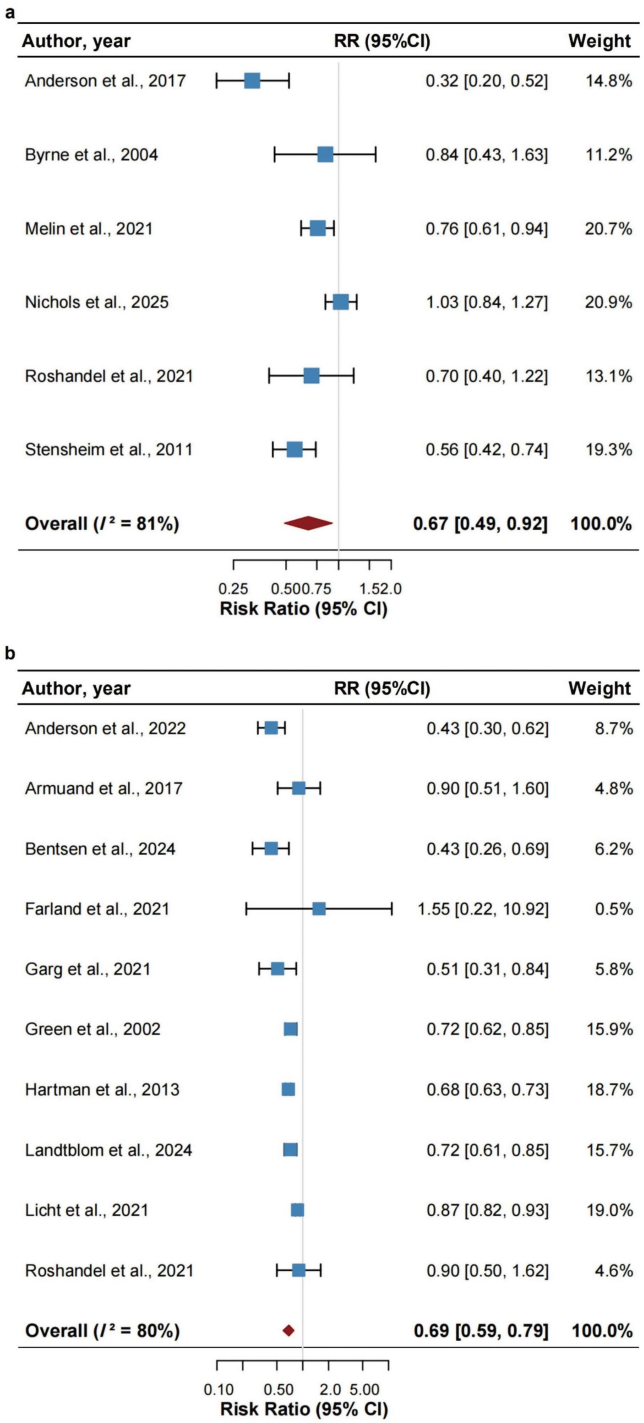

Figure 2. Forest plot from a meta-analysis of pregnancy (a) and live birth (b) outcomes in HM survivors. RR, Relative risk; CI, Confidence intervals.

survivors had significantly lower pregnancy rates (RR: 0.67, 95% CI: 0.49-0.92) and live birth rates (RR: 0.69, 95% CI: 0.59-0.79) than the general population (Figure 2). Substantial heterogeneity was observed (pregnancy: I^2 = 81.0%; live birth: I^2 = 80.0%). No significant publication bias was detected (Egger's test, P > 0.05).

Subgroup analyses (Supplementary Table 7) showed trends consistent with the overall analysis. When stratified by HM type, the pooled RR for pregnancy was 0.50 (95% CI: 0.25-1.03) for leukemia (5 studies, I^2 = 96%) and 0.65 (95% CI: 0.36-1.19) for lymphoma (3 studies, I^2 = 94%). Among lymphoma subtypes, the RR was 0.70 (95% CI: 0.41-1.19) for Hodgkin lymphoma (HL; 3 studies, I^2 = 96%) and 0.57 (95% CI: 0.32-0.99) for non-Hodgkin lymphoma (NHL; 3 studies, I^2 = 93%). By age at HM onset, childhood/adolescent-onset cases showed a significantly reduced risk of pregnancy (RR = 0.77, 95% CI: 0.68-0.87; 4 studies, I^2 = 0), whereas the estimate for adolescent/adult or mixed-age onset was not statistically significant (RR = 0.62, 95% CI: 0.37-1.03; 3 studies, I^2 = 92%). According to treatment era, early era studies yielded an RR of 0.78 (95% CI: 0.67–0.92; 2 studies, I^2 = 0), and middle/mixed era studies gave an RR of 0.60 (95% CI: 0.45-0.79; 4 studies, I^2 = 72%). For live birth, the RR for leukemia was 0.52

(95% CI: 0.37-0.75; 8 studies, I^2 = 97%) and for lymphoma was 0.70 (95% CI: 0.58–0.84; 6 studies, I^2 = 92%). Among lymphoma subtypes, HL was associated with an RR of 0.75 (95% CI: 0.60-0.94; 5 studies, I^2 = 94%) and NHL with an RR of 0.69 (95% CI: 0.55-0.87; 5 studies, I^2 = 87%). By age at onset, childhood/adolescent-onset cases had an RR of 0.85 (95% CI: 0.79-0.90; 5 studies, I^2 = 8%), while adolescent/adult or mixed-age onset showed an RR of 0.64 (95% CI: 0.57-0.73; 7 studies, I^2 = 52%). Sensitivity analyses confirmed the robustness of the pooled estimates (Supplementary Tables 8-9).

Mode of delivery

Four studies reported delivery rates and seven reported cesarean section risk. Random-effects meta-analyses showed that HM survivors had a significantly lower delivery rate (RR: 0.80, 95% CI: 0.71-0.91) and a significantly higher risk of cesarean section (RR: 1.23, 95% CI: 1.13-1.35) compared with the general population (Figure 3). Heterogeneity was low (delivery: I^2 = 42.4%; cesarean section: I^2 = 21.9%).

Subgroup analyses (Supplementary Table 10) revealed that both leukemia (RR: 1.34, 95% CI: 1.19-1.51) and lymphoma (RR: 1.14, 95% CI: 1.04-1.25) were associated with an increased risk of cesarean section. Meta-regression did not explain the observed heterogeneity (P > 0.05). Sensitivity analyses were consistent with the main findings, and no significant publication bias was detected (Egger's test, P > 0.05; Supplementary Table 11).

Adverse pregnancy outcomes

Twenty-three studies reported on adverse pregnancy outcomes, covering spontaneous abortion (n = 5), induced abortion (n = 5), stillbirth (n = 3), preterm birth (n = 12), SGA (n = 5), LBW (n = 7), and birth defects (n = 8). Random-effects meta-analyses showed that HM survivors had significantly elevated risks of preterm birth (RR: 1.39, 95% CI: 1.24-1.55) and LBW (RR: 1.29, 95% CI: 1.06-1.57), with low heterogeneity (preterm birth: I^2 = 36.0%; LBW: I^2 = 16.0%; Figure 4). The pooled estimates for spontaneous abortion (RR: 1.12, 95% CI: 0.87-1.46), induced abortion (RR: 1.11, 95% CI: 0.89-1.39), stillbirth (RR: 1.40, 95% CI: 0.90-2.91), birth defects (RR: 1.14, 95% CI: 0.93-1.39), and SGA (RR: 1.08, 95% CI: 0.85-1.37) were not statistically significant. For these non-significant outcomes, moderate-to-substantial heterogeneity was observed (I^2 range: 51.0%–66.0%). No significant publication bias was detected (Egger's test, P > 0.05).

Subgroup analyses (Supplementary Table 12) indicated that risks of preterm birth and LBW varied by HM type. For preterm birth, the pooled RR was 1.36 (95% CI: 1.11-1.66) for leukemia (7 studies, I^2 = 49%) and 1.59

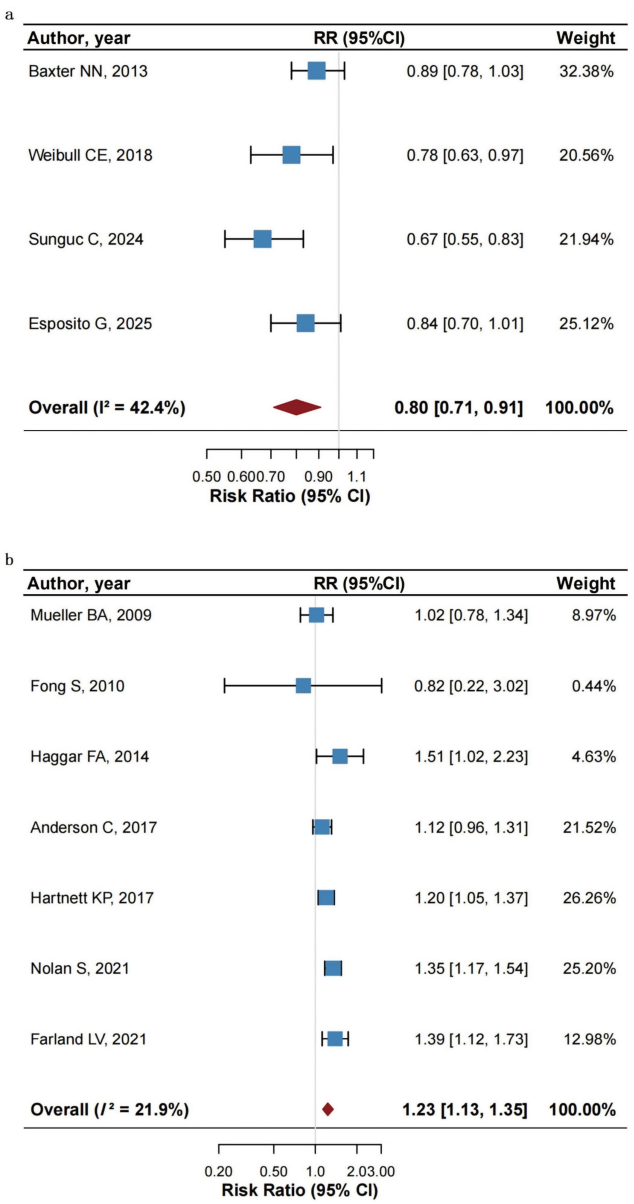

Figure 3. Forest plot from a meta-analysis of delivery rate (a) and cesarean section (b) outcomes in HM survivors. RR, Relative risk; CI, Confidence intervals.

(95% CI: 1.24-2.03) for lymphoma (7 studies, I^2 = 65%). For LBW, leukemia survivors had a significantly increased risk (RR: 1.73, 95% CI: 1.44-2.07; 3 studies, I^2 = 0), while the estimate for lymphoma survivors was not significant (RR: 1.14, 95% CI: 0.72-1.82; 4 studies, I^2 = 47%). For stillbirth, no significant association was found in either subgroup, although point estimates were higher for lymphoma (RR: 1.77, 95% CI: 0.91-3.44) than for leukemia (RR: 1.18, 95% CI: 0.65-2.13). For birth defects, lymphoma survivors showed a significantly increased risk (RR: 1.22, 95% CI: 1.02-1.45; 3 studies, I^2 = 0), whereas the estimate for leukemia survivors was highly imprecise (RR: 0.80, 95% CI: 0.06-10.14; 2 studies, I^2 = 79%). Spontaneous and induced abortion risks did not differ significantly between leukemia and

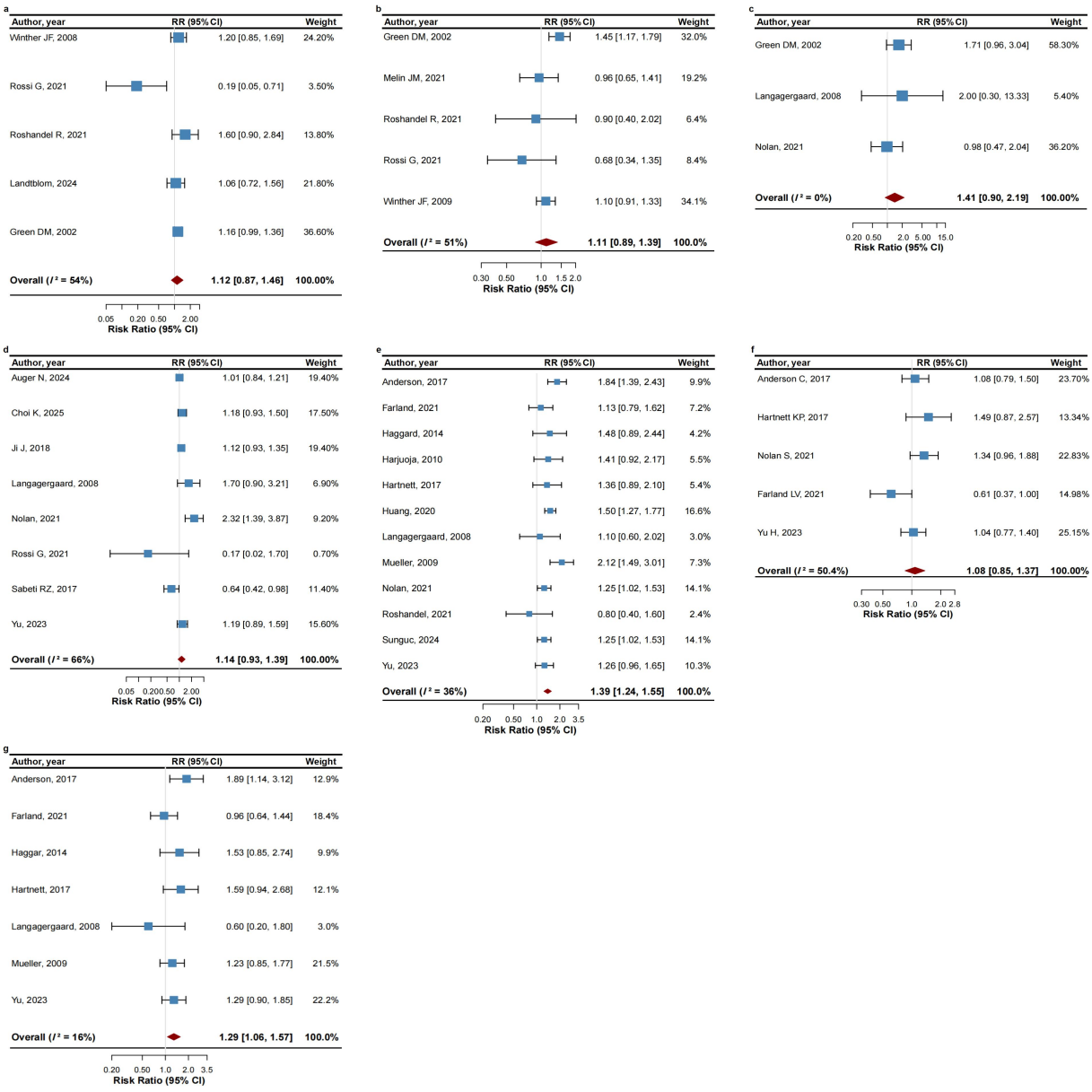

Figure 4. Forest plot from a meta-analysis of spontaneous abortion (a), induced abortion (b), stillbirth (c), birth defects (d), preterm birth (e), small for gestational age (f), and low birth weight (g) outcomes in HM survivors. RR, Relative risk; CI, Confidence intervals.

lymphoma subgroups (data not shown). Sensitivity analyses confirmed the stability of the risk estimates (Supplementary Tables 13-19).

Pregnancy complications

Five cohort studies reported pregnancy complications. Random-effects meta-analyses showed a significantly increased risk of GDM in HM survivors (RR: 1.27, 95% CI: 1.01-1.58; I^2 = 41%; Figure 5). The risk of hypertensive disorders of pregnancy was not significantly elevated (RR: 1.15, 95% CI: 0.93-1.40; I^2 = 50%), with most studies showing a consistent direction of effect.

Sensitivity analyses confirmed the stability of the risk estimates (Supplementary Tables 20-21).

DISCUSSION

Main findings

This meta-analysis demonstrated that, compared with the general population, HM survivors had significantly reduced pregnancy and live birth rates and significantly elevated risks of preterm birth, LBW, and GDM. In contrast, the risk estimates for spontaneous abortion, induced abortion, stillbirth, hypertensive disorders of pregnancy, SGA, and birth defects did not reach statistical significance.

Comparison with existing literature

Previous studies have raised safety concerns regarding a potentially higher risk of adverse reproductive outcomes

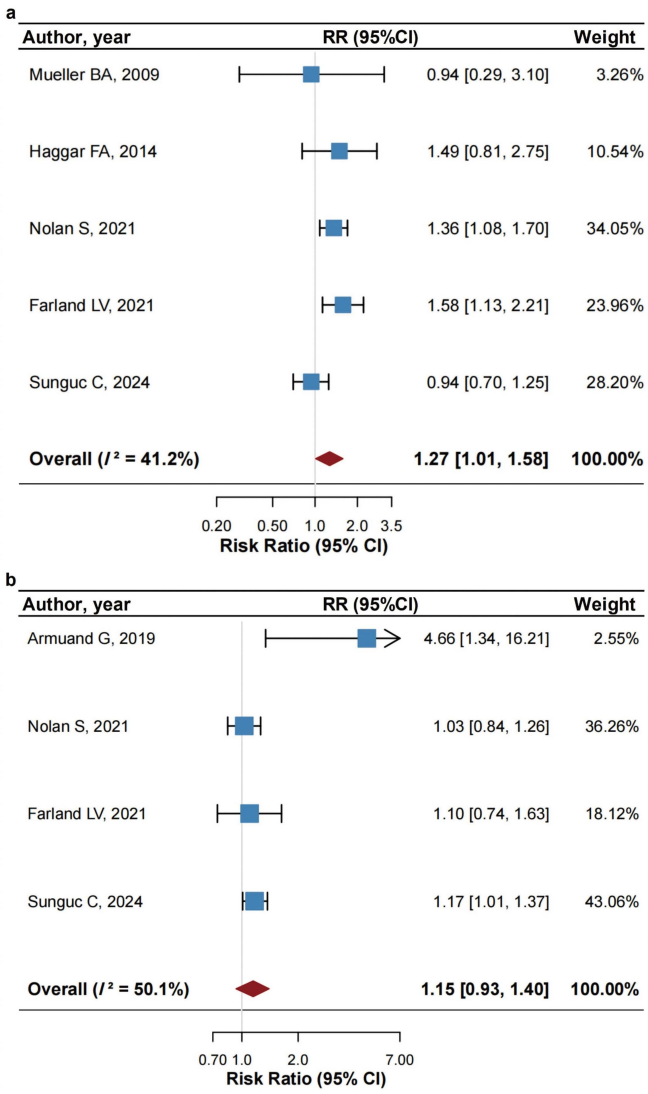

Figure 5. Forest plot from a meta-analysis of GDM (a) and hypertensive disorders of pregnancy (b) outcomes in HM survivors. RR, Relative risk; CI, Confidence intervals.

in survivors previously exposed to anticancer therapies.[58–60] The present meta-analysis, focusing specifically on HM survivors, provides evidence that supports these concerns for several outcomes. A previous systematic review of HL survivors reported no significantly increased risks of birth defects, preterm birth, or miscarriage; however, that review included only 19 studies published between 1976 and 2017 with small numbers of pregnancies, limiting the ability to draw robust conclusions.[14] Our study included thirty-seven cohort studies and allowed several subgroup analyses, thereby providing more convincing evidence that HM survivors have increased risks of preterm birth, LBW, and stillbirth, while the risks of spontaneous and induced abortion did not reach statistical significance. Although the exact mechanisms underlying these observed associations are uncertain, there are two plausible explanations for the adverse pregnancy outcomes of HM survivors. First, previous studies have shown that cancer treatments are predisposed to uterine blood flow restriction, smaller uterine volume, and, reduced uterine distensibility, as well as disrupting the balance of sex hormones, leading to adverse effects on the implantation of embryos and maintenance of pregnancy.[61–63] Notably, extensive evidence in animal models supports the potential of alkylating agents and radiation to produce not only somatic but also germ-line mutations leading to genetic disease in offspring.[64–67] Despite this, in line with our findings, previous observational studies have reported that the trend for an increased risk of congenital abnormalities observed in the offspring of cancer survivors did not reach statistical significance.[68] However, one of the largest studies included in our study reported that the risk of malformation was significantly increased, more than two-fold, among leukemia patients who received the latest, more aggressive chemotherapy regimens as compared with the general population.[46] Further exploration is needed to investigate the effect of chemotherapy drugs on offspring malformation in the future. Second, the proportion of women who delay childbearing beyond the age of 35 years has greatly increased in recent decades, which is a high-risk factor for adverse pregnancy outcomes.[3,69,70] Even though many included studies adjusted for maternal age, the possibility of increased risk of adverse pregnancy outcomes due to increased maternal age cannot be ignored. We did not observe a significant association between prior HM and SGA in the main analysis. However, a significantly increased risk of SGA was observed in the sensitivity analysis when excluding the study of Farland (Supplementary Table 10),[48] in which the effect value was calculated using raw data without adjusting the confounding factors. Therefore, the relationship between the HM history of the mother and SGA remained inconclusive.

Several studies have raised awareness of the low likelihood of future pregnancy in HM survivors.[71] Our meta-analysis quantifies this impact, demonstrating that HM survivors have a substantially reduced probability of achieving a subsequent pregnancy. Several potential mechanisms might be explanations for the phenomenon. First, patients with HM usually need to be observed at least 3 years after completing adequate treatment, which is the peak time for recurrence. Therefore, pregnancy is not recommended during this period. Second, radiation and chemotherapy (*e.g.*, Alkylating agents, Platinum-based compounds) lead to pathological changes in the reproductive system, such as premature ovarian failure, accelerating follicular apoptosis and follicle reservoir utilization, and reduction of sperm counts, often to azoospermia levels.[62,72,73] This damage contributes to the lower likelihood of pregnancy and childbirth.

Furthermore, most cancer survivors overestimated the risk of infertility, which was related to various sociodemographic, gonadotoxic, and reproductive factors, as well as sexual dysfunction, causing survivors to choose to give up trying to conceive.[74] Therefore, fertility testing and oncofertility counseling should be provided to cancer survivors who have fertility problems (such as irregular menstruation, sexual dysfunction, *etc.*) or have a desire to become pregnant. In addition, we may attribute the reduction of live birth to the increased risk of abortion, stillbirth, and infertility for HM survivors.

We found that GDM featured more frequently among HM survivors. Possible associations between HM and maternal diabetes had been studied. On the one hand, metabolic disturbance due to advanced pregnant age contributes to the occurrence of GDM.[3,69] On the other hand, the immunologic and inflammatory effects caused by radiation and allogeneic hematopoietic cell transplantation play a role in the development of insulin resistance through fibrosis of islet cells.[75,76]

It is worth noting that, the pooled risk estimates were slightly different between leukemia and lymphoma survivors in terms of LBW, abortion, and likelihood of pregnancy, even though no heterogeneity was noted by meta-regression analysis. Although the treatment of leukemia and lymphoma both includes bone marrow transplantation, radiotherapy, and chemotherapy, treatment regimens vary according to the type and stage of disease, and the patient's status, such as the sensitivity and tolerance of adverse effects to the specific medicine or radiation.[77] Therefore, further studies are needed to investigate the pregnancy outcomes of patients with leukemia and lymphoma in the future.

Strengths and limitations

The strengths of our meta-analysis should be emphasized. First, the present study is the first to synthesize evidence from cohort studies covering a range of pregnancy outcomes, allowing comprehensive comparisons among these outcomes. Second, we systematically searched multiple databases and identified pertinent studies based on rigorous inclusion criteria to enable unbiased inclusion. Third, the inclusion of subgroups, sensitivity, and meta-regression analyses that demonstrated results comparable with the main findings increased our confidence in the results. Moreover, we employed the more sophisticated A MeaSurement Tool to Assess systematic Reviews 2 instrument to assess methodological quality to achieve higher validity and reliability (Supplementary Table 22).

Several limitations of the present study should be considered. First, heterogeneity exists in some outcome analyses which could be attributed to the inclusion of studies with different inclusion and exclusion criteria, adjusted factors, reference groups, and the definitions of outcomes. However, random-effect models and meta-regression analyses were used to find the source of heterogeneity. Despite extensive subgroup and sensitivity analyses, substantial heterogeneity remained for some outcomes (*e.g.*, pregnancy and live birth), which may reflect unmeasured differences in treatment protocols, healthcare systems, or outcome definitions across studies. Second, studies included in the meta-analysis ranged in methodological quality, which limited the ability to draw concrete conclusions from the study. Third, not all the preplanned subgroup analyses could be conducted because of the paucity of details in the included studies on the effect of anticancer therapies, stage of HM, and patient's age at diagnosis. This highlights the need to pursue further research in these areas. Fourth, for outcomes with fewer than 10 included studies (*e.g.*, stillbirth, $n = 3$; GDM, $n = 5$), the non-significant Egger's test results should be interpreted with caution, as the test has low statistical power in such cases. The corresponding pooled estimates may be unstable, and future large-scale studies are needed to confirm these findings. Fifth, the absence of prospective protocol registration may increase the risk of selective reporting, particularly given the large number of outcomes and subgroup analyses. In addition, we failed to ascertain the association between the history of other HM and pregnancy outcomes, such as multiple myeloma and myelodysplastic neoplasms. However, they have an older preponderance with a median age of 69 years and 70 years at diagnosis, respectively.[58,78] Finally, only considering the inclusion of English articles may limit our potential to capture all relevant studies and omit important information from other language studies. However, the comprehensive search of multiple databases for studies published in English should have covered the majority of all available reports.

CONCLUSION

This systematic review and meta-analysis suggests an association between a history of hematological malignancy and several adverse pregnancy outcomes, including preterm birth, LBW, and GDM. Furthermore, pregnancy and live birth rates appear lower among HM survivors compared with the general population. These findings underscore the importance of oncofertility counseling and reproductive health surveillance for HM survivors of childbearing age.

DECLARATIONS

Supplementary information

Supplementary materials are only available at the official site of the journal (www.hksmp.com).

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None.

Author contributions
Li W, Hua Y: Concept Development. Li W, Li M, Hui S, Liu RQ and Hua Y: Design. Li W, Li M, Hui S, Liu RQ: Data Collection; Cleaning and Analysis; Difference Review. Li W, Hua Y: Article Drafting and Revision. All authors interpreted the data, read the manuscript, and approved the final version.

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Ethical approval
Not applicable.

Informed consent
Not applicable.

Conflict of interest
The authors declare no competing interests.

Use of large language models, AI and machine learning tools
No artificial intelligence (AI) tools or large language models (LLMs) were used in the design, conduct, analysis, or writing of this study.

Data availability statement
All data generated or analysed during this study are included in this published article (and its supplementary information files).

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