Reproductive Health

REVIEW

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The prevalence of adolescent pregnancy and its associated consequences in the Eastern Mediterranean region: a systematic review and meta-analysis

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Abstract

Background Adolescent pregnancy is one of the public health problems that both mother and baby suffer from its consequences. This study was conducted to estimate the prevalence and consequences of adolescent pregnancy in the Eastern Mediterranean region.

Methods In this systematic review and meta-analysis, four databases (PubMed, ProQuest, Web of Science and Scopus) were systematically searched for relevant articles published from 1990 to 2022. The screening process for articles was conducted in accordance with the PRISMA guidelines. Joanna Briggs checklists were used to assess the quality of included studies. A random effects model was performed for the meta-analysis. Narrative synthesis of adolescent pregnancy prevalence, as well as a meta-analysis of adolescent pregnancy prevalence was performed using STATA 14.

Results The review included 12 studies and 94,189 study participants. The prevalence of adolescent pregnancy was [9% (95% CI 6.9, 11.2, $p < 0.001$)]. Pregnancy outcomes included preeclampsia [12.9%(95% CI 7.3,18.5, $p < 0.001$)], low birth weight [16.1%(95% CI 7.4–24.8, $p < 0.001$)], anemia [33%(95% CI 14.4, 51.7, $p < 0.001$)], and cesarean delivery [15.9%(95% CI 11.1–20.7, $p < 0.001$)].The results showed that 16.9% of deliveries were cesarean sections.

Conclusion The study's findings indicate that adolescent pregnancy is prevalent in the Middle East region and is associated with negative outcomes for teenagers. Therefore, it is necessary to carry out effective interventions to reduce adolescent pregnancy.

Keywords Adolescent pregnancy, Prevalence, Pregnancy outcome, Systematic review, Meta-analysis

Introduction

The World Health Organization (WHO) defines adolescent pregnancy as the occurrence of pregnancy in girls aged 10 to 19 years old, and the United Nations International Children's Fund (UNICEF) defines AP as pregnancy in girls 13–19 years old [1, 2]. About 21 million girls between the ages of 15 and 19 in developing countries become pregnant each year, and nearly 12 million of them give birth. In developing countries, at least 777,000 births were reported to mothers under the age of 15 [3].

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Adolescent pregnancy is a well-known public health problem that has multiple impacts on individuals, families, and society as a whole [4]. The pattern of adolescent pregnancy is different in developing and developed countries. In developing countries, most teenage pregnancies occur among married girls [5]. In developed countries, adolescent pregnancy usually occurs outside of marriage [6]. The United States has the highest adolescent pregnancy rate in the developed world, with 57 pregnancies per 1000 girls aged 15 to 19, according to a 2015 study [7]. The rate of teenage births has decreased annually since 2009, reaching a new record low. However, the United States continues to have a higher rate of teenage births compared to several other developed nations such as Canada and the United Kingdom [8, 9].

Researchers have identified socio-cultural factors such as poverty [10], and early marriage [11, 12], individual factors such as excessive alcohol consumption [13], the inability to resist sexual temptation [14], lack of related health services and the cost of contraceptives [15], the lack of comprehensive sex education as influencing adolescent pregnancy [16].

Adolescent pregnancy is associated with high maternal and infant morbidity and mortality, which can have a significant impact on the socioeconomic development of a country [17]. Additionally, adolescents are at higher risk for adverse pregnancy and birth outcomes compared with older women [18]. Pregnancy and childbirth complications are the leading cause of death globally among adolescent girls aged 15 to 19. The lifetime risk of maternal death for a 15 year-old girl is 1 in 37 in sub-Saharan Africa, compared with 1 in 6500 in Europe and 1 in 7800 in Australia and New Zealand [19]. Low birth weight, prematurity, abnormal blood pressure during pregnancy and infection are the most important factors in maternal and neonatal mortality [20].

Many governments have developed adolescent pregnancy prevention strategies [21, 22], and are working to achieve the Sustainable Development Goals (SDGs) and reduce the global maternal mortality ratio to 70 per 100,000 live births [23]. However, the social, cultural, and political conditions in the Eastern Mediterranean region seriously challenge the implementation of adolescent pregnancy prevention programs. Shared geographical, ethnic, tribal and cultural characteristics contribute to the prevalence of teenage marriage in the region. Reproduction has been considered a racial and tribal prerogative and followed religious teachings [24].

The determinants and outcomes of adolescent pregnancy have been characterized in several systematic studies [25, 26]. In a systematic review, Fan (2022) suggested that adolescent pregnancy is one of the consequences of child marriage [27]. In several studies, the prevalence of adolescent pregnancy has been systematically reported in African countries [28–30]. To date, the prevalence of adolescent pregnancy in the Eastern Mediterranean region has not been systematically investigated. Estimating the prevalence of adolescent pregnancy and its consequences may assist concerned countries and indicate the need for interventions to control adolescent pregnancy. This systematic review and meta-analysis aimed to assess the prevalence and outcomes of adolescent pregnancy in the Eastern Mediterranean region.

Methods

Study design and search strategy

In this review, we followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [31]. We searched PubMed, ProQuest, Web of Science, and Scopus databases to identify relevant articles. Systematic searches were performed based on Medical Subject Headings (Mesh) terms, selected keywords, and free words as search terms. The search terms included "adolescent pregnancy", incidence, and prevalence combined by the Boolean operators "AND" and "OR" (Table S1). In addition, in this search, the names of all countries within the Eastern Mediterranean were combined with the above search terms.

Study selection and eligibility criteria

We included English-language scientific articles or theses published between 1990 and 2022. Further, included articles needed to be cross-sectional, cohort, case–control, or intervention studies, reporting on adolescent pregnancy. Qualitative articles, as well as articles published as review studies, editorials, comments, presentations, or conference abstracts, were excluded. We screened the references of the selected articles to retrieve any other articles that may not have been included in this review. Further details are given in Table S2.

Definition of adolescent pregnancy

In this study, pregnancies between the ages of 10–19 years were introduced as adolescent pregnancy according to the WHO definition. The marital or celibate status of pregnant adolescents was unknown in the included studies. Adolescent pregnancy was identified among women who attended health centers for antenatal care or attended hospital for delivery care.

Data extraction

To select eligible articles, we removed duplicates, and then articles were screened using title, abstract, and full-text. Data extraction tools for research information included authors and year of publication, study area, study design, sample size, age range, and prevalence of

adolescent pregnancy. Two independent researchers conducted all stages of the review (search, screening, and data extraction). If both reviewers (AP, HA) agreed 100%, the article was included in the review. In addition, any disagreements between authors regarding the eligibility of articles were resolved through consultation or discussion with the first and second authors (MV, HT).

Quality assessment

There were two types of study design in this systematic review (cross-sectional, case–control). Therefore, we used two separate Joanna Briggs checklists [32]. To compare the quality assessment score, the scores of each study were presented as percentages. The quality assessment score in the cross-sectional design was between 14 and 28%. The quality assessment score in the control case design was between 10 and 40%. JBI scores above 70% were considered to indicate high quality, while scores ranging from 50 to 70% indicated medium quality, and scores below 50% indicated low quality [33–35]. More details of the quality assessment of articles are shown in Tables S3, S4.

Statistical methods and analysis

We entered data into Microsoft Excel and performed meta-analyses using STATA 14 software.

Forest plots were used to show the prevalence of adolescent pregnancy in Eastern Mediterranean. In addition, subgroup analyses were performed by different study specifications, such as study design (retrospective or cross-sectional) for resolving heterogeneity. The quality of the included articles was poor, so subgroup analysis was not performed based on the quality of the articles. The pooled prevalence of adolescent pregnancy outcomes (anemia, preeclampsia, low birth weight, cesarean section) was also determined. In this study, the funnel plot was utilized to assess publication bias. However, due to a limited number of studies meeting the criteria for inclusion in the meta-analysis, the funnel plot results alone were not conclusive. Subsequently, an Egger's regression was conducted which revealed significant publication bias. The overall estimate was adjusted by employing the trim-and-fill method to accommodate for the approximate number of studies that were excluded due to censorship. It is worth mentioning The trim-and-fill method is a two-step approach derived from funnel plots, designed to both detect publication bias and correct results accordingly [36].

Results

Study selection

Through the electronic database search, 4066 records were retrieved. After removing the duplicate articles, and reviewing the abstracts and the full text of the articles, 10 articles were eligible to be included in the study [37–46]. Two articles were added after a hand search of references [47, 48]. The final 12 articles were included in a systematic review and meta-analysis (Fig. 1).

Characteristics of included studies

The included studies reported the prevalence of adolescent pregnancy in seven countries. In total, five studies (41.6%) were from Iran [39, 40, 43, 44, 47], two studies (16.6%) were from Saudi Arabia [38, 41] and one article was included from the countries Iraq (8.3%) [46], Oman (8.3%) [37], Lebanon (8.3%) [42], Jordan (8.3%) [48], and Pakistan (8.3%) [45]. Articles were published from 1995 to 2020. The sample size of the studies ranged from a minimum of 382 [43] to a maximum of 26,207 [48]. Overall, 94,189 participants were included in this review (Table 1). Four articles (33.3%) had a cross-sectional design [43, 44, 46, 47] and eight articles (66.7%) had a retrospective design [37–42, 45, 48].

Prevalence of adolescent pregnancy in Eastern Mediterranean

After adjustment, the pooled prevalence of adolescent pregnancy in Eastern Mediterranean was 9% (95% CI 6.9, 11.2, $p < 0.001$). Two Iranian studies reported the highest [43] and lowest [47] prevalence rates. The highest prevalence was observed in the study from Kalhor et al. [31.9% (95% CI 27.5–36.8)] and the lowest prevalence was observed in study from Zahiri et al. [0.9% (95% CI 0.7–1.1)].

The cross-section design studies [41, 43, 44, 46, 47] showed a higher prevalence of adolescent pregnancy 13.6% (95% CI 5.5–21.7, $p < 0.001$) compared with retrospective studies 6.6% (4.3–8.9) (Fig. 2).

Consequences of adolescent pregnancy

Consequences of adolescent pregnancy included in this analysis were anemia, preeclampsia, low birth weight (LBW), cesarean section, and Normal Vaginal Delivery (NVD). A separate analysis was conducted for each variable. Seven articles [37–39, 41, 45, 46, 48] were included to determine the prevalence of anemia in adolescent pregnancy. The meta-analysis indicated that anemia was seen in 33% (95% CI 14.4, 51.7, $p < 0.001$) of adolescent pregnancies (Fig. 2A–D). All 12 studies were used to measure the prevalence of pre-eclampsia in AP. The result of the meta-analysis showed that 12.9% (95% CI 7.3, 11.2, $p < 0.001$) of the adolescent pregnancies developed preeclampsia (Fig. 2A–D). Seven studies [38, 39, 42, 44–46, 48] were included to assess LBW in adolescent pregnancy. The results showed that 16.1% (95% CI 7.4–24.8, $p < 0.001$) of adolescent pregnancies were associated with

Table 1 Characteristics included studies in a systematic review and meta-analysis

Author/years	Country	Study design	Sample size	Adolescent pregnant (n)	Age range	Prevalence (%)
Abdullah, et al. [46]	Baghdad	Descriptive study	5848	1286	17.4 ± 1.5	22
Abu-Heija, et al. [37]	Oman	Retrospective study	21,424	391	14–19	1.83
El-Gilany, et al. [38]	Saudi Arabia	Retrospective record-based comparative study	5142	484	< 20	9.40
Jamali, et al. [39]	Iran	Retrospective study	2049	154	18.22 ± 0.97	7.6
Kalhor, et al. [43]	Iran	Descriptive study	382	122	17.9 ± 1.25	31.9
Khooshideh, et al. [40]	Iran	Retrospective cohort study	10,352	1235	16.8 ± 0.19	11.93
Mahfouz, et al. [41]	Saudi Arabia	Cohort study	2078	214	< 20	10.3
Nili, et al. [44]	Iran	Descriptive study	2357	99	17.4 ± 0.85	4
Nusrat Shah, et al. [45]	Pakistan	prospective case–control study	3075	179	18.4 ± 0.8	5.82
USTA, et al. [42]	Lebanon	Retrospective, chart-review study	9,230	586	18 ± 1.1	2.50
Zahiri, et al. [47]	Iran	cross-sectional analytic study	6045	52	< 18	0.80
Ziadeh- hand. [48]	Jordan	Retrospective study	26,207	850	< 19	2.90

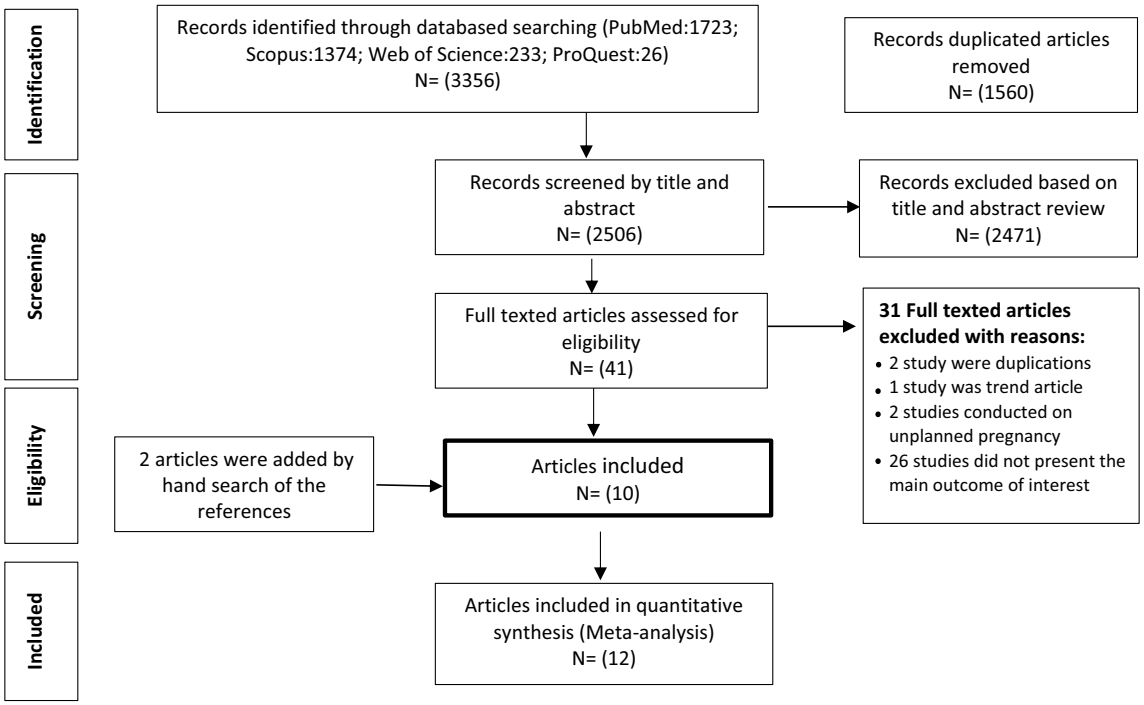

Fig. 1 Flow diagram of the included studies for the systematic review and meta-analysis of prevalence and consequence of adolescent pregnancy in Eastern Mediterranean

LBW. Nine articles [37–40, 42–44, 47, 48] were used to assess the prevalence of cesarean section in adolescent pregnancies. The results showed that 15.9% (95% CI 11.1–20.7, $p < 0.001$) of the deliveries were cesarean sections. Six articles [37–39, 42, 43, 48] were examined to determine the prevalence of NVD in adolescent pregnancy. The meta-analysis showed that 72.5% (53.7–91.3) of AP ended with NVD (Fig. 3 A–C).

Reporting publication biases

The meta-analysis revealed a significant publication bias in the included articles, as indicated by Egger's regression test and the funnel plot's asymmetry (bias = 20.57, 95% CI 9.18–31.96, $p = 0.002$) (Figs. 4, 5). To address this bias, a non-parametric Trim-and-fill model was employed, identifying six potential studies on adolescent pregnancy prevalence that were omitted from the analysis. With this

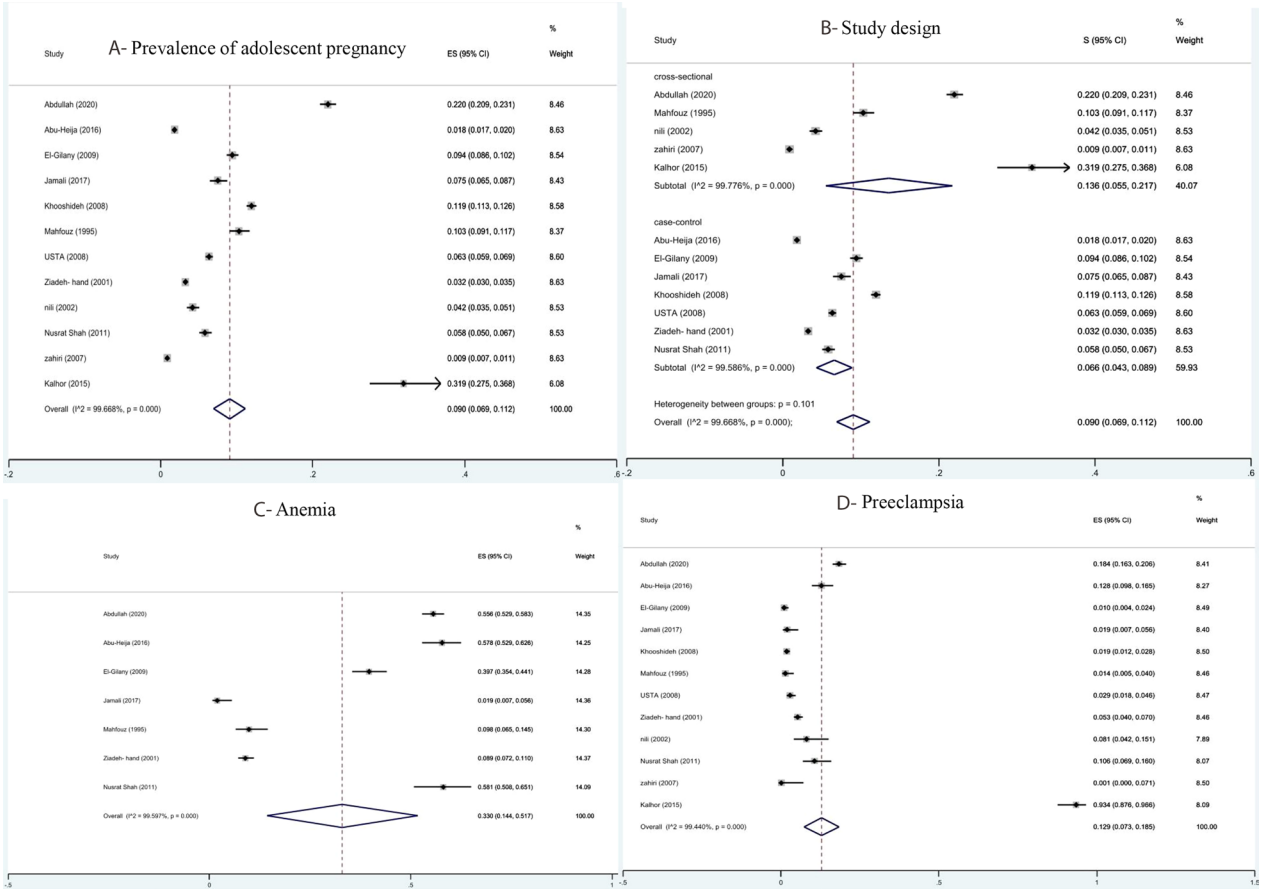

Fig. 2 **A**–**D**: Prevalence of adolescent pregnancy (**A**) and sub-group analysis based on Study design (**B**), Anemia (**C**), Preeclampsia (**D**) in EM

correction, the estimated pooled prevalence of adolescent pregnancy, accounting for random effects, was 2.8% (95% CI 0.6–5.1, p = 0.01) (Table S5).

Discussion

We conducted this systematic review and meta-analysis to determine the prevalence and consequences of adolescent pregnancy in Eastern Mediterranean. Adolescent pregnancy is recognized as a serious risk to the health of mothers and infants. The pooled prevalence of adolescent pregnancy in Eastern Mediterranean countries was 9%. Early marriage is likely to lead to high fertility rates among adolescent girls. Teenage marriage is common in most countries in the region and political and social instability, war, civil unrest, and widespread displacement increase the chances of getting married early in Eastern Mediterranean.

The outcomes of adolescent pregnancy

Across the studies included in this review, about 33% of the adolescents suffered anemia during pregnancy, which may reflect the nutritional deficiency in adolescents. Adolescence is a critical period of growth and development, and adolescent mothers are still undergoing physical maturation themselves. This can lead to increased nutritional demands that may not be adequately met, especially if the adolescent has limited access to a balanced and nutrient-rich diet. Other evidence also confirms this finding [49, 50]. Pregnant adolescents have more nutritional needs than adults, however, higher rates of nutritional deficiencies have been reported in pregnant adolescents [51]. In our study, the prevalence of preeclampsia in adolescent pregnancy was 12.9%. Preeclampsia mainly affects nulliparous women [52]. Micronutrient deficiencies, insufficient calcium intake [53], and Body Mass Index > 30 [54] increase the risk of preeclampsia. Limited antenatal care may be associated with the risk of preeclampsia in pregnancy [55, 56]. In some studies, low rates of diabetes and chronic hypertension were introduced as protective factors for preeclampsia in adolescent pregnancy [57, 58].

LBW was defined as a birth weight of less than 2500 g. About 15–20% of all births in the world, (more than 20 million births a year) [59], and 19.3% of births in Eastern

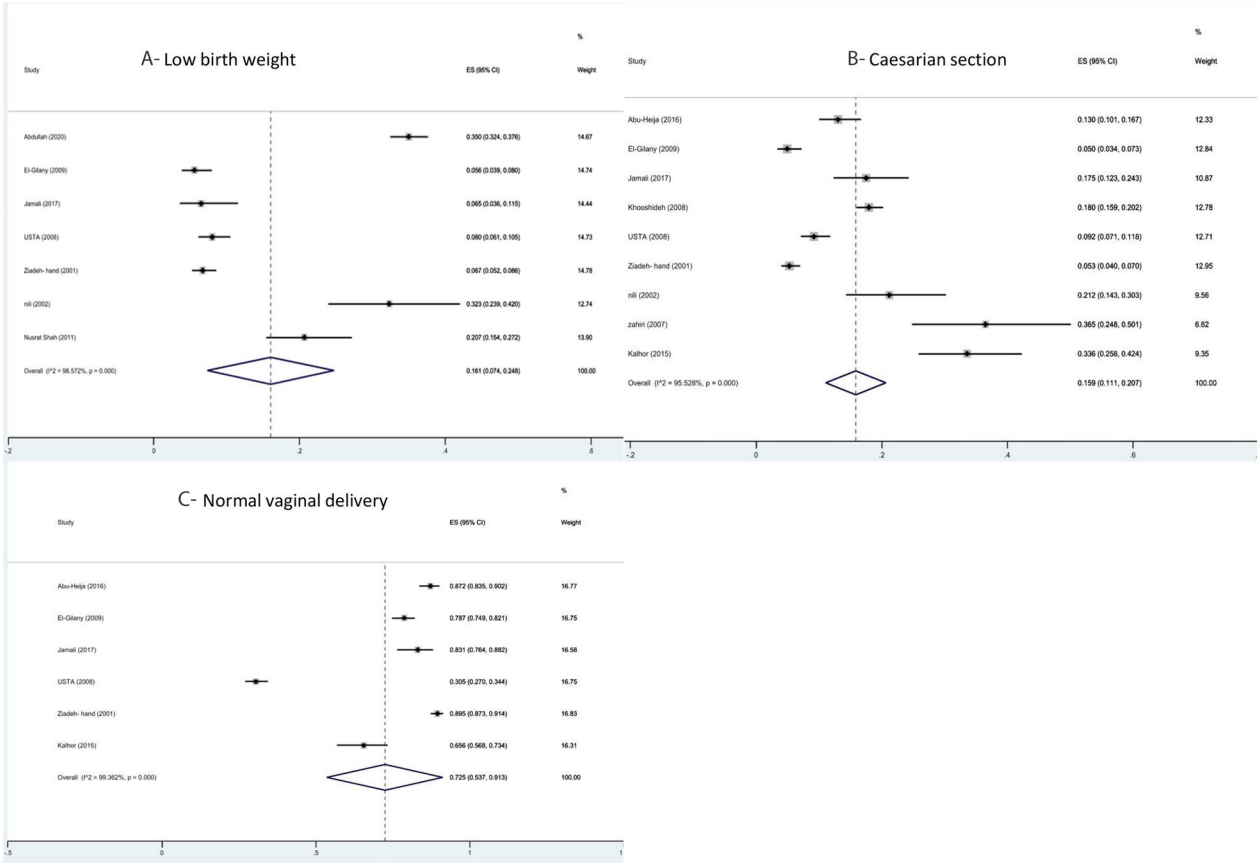

Fig. 3 **A**–**C**: Sub-group analysis based on Low birth weight (**A**), Caesarian section (**B**), and Normal vaginal delivery (**C**) in EM

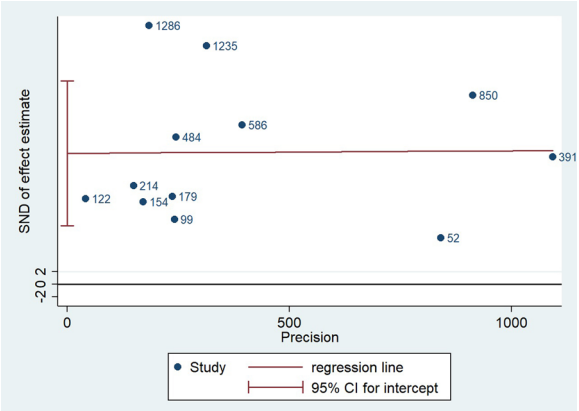

Fig. 4 Contour-enhanced funnel plot displaying approximate 95% confidence interval boundaries to identify publication bias

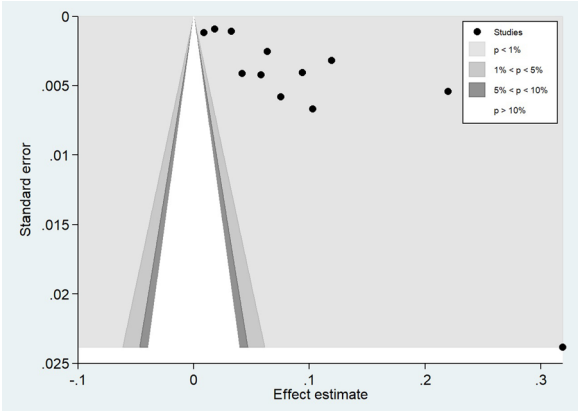

Fig. 5 Egger's Publication bias plot

Mediterranean were LBW [60]. In our study, 16.1% of infants were born with an LBW. In most studies, LBW is considered one of the consequences of adolescent pregnancy [61–63]. Physical immaturity, low gestational weight, and poor nutritional status in adolescent pregnancy may be responsible for low weight gain [55, 64]. Adolescent pregnancy and consequent low birth weight are a serious challenge to achieve the goal of reducing 30% of low birth weight babies, which is one of the goals of the World Health Organization by 2025. Reaching this goal would translate to a reduction from

approximately 20 million to about 14 million infants with LBW.

In all articles, the number of mothers with NVD was higher than with cesarean Sect. (72.5%, vs 16.9%). Different cesarean section rates have been reported in studies [65]. Several studies [58, 66, 67] suggest that pregnant adolescents have higher rates of cesarean section. In some studies, lower rates were reported [68, 69], while another study found no difference between adolescent and adult women [70, 71]. Biological immaturity of the pelvis, hypertension, diabetes, high body mass index, high infant weight, and preterm birth affect the type of childbirth in adolescents. Of course, the influence of the family and the choice of delivery method should not be underestimated [72].

The meta-analysis uncovered a notable bias in the published articles, highlighted by Egger's regression test, the funnel plot's lack of symmetry, and the trim-and-fill method. The sensitivity analysis conducted using the mentioned methods reveals a notable shift in the calculation of the prevalence rate. This suggests that the number of studies conducted in the Eastern Mediterranean region is limited, highlighting the necessity for additional research endeavors. Another factor that may account for these variations should also be considered. Publication bias review models and sensitivity analysis models have been utilized in numerous studies [73, 74].

Limitations of the Study

This review has certain limitations. In clinical-based studies, prepared prevalence data may indicate bias because the studied population may not be representative of the overall population. We were unable to obtain national surveys in the region, and the number of studies reporting the prevalence of adolescent pregnancy was small, which could affect the estimation of the results. Another limitation of the study was the inclusion of retrospective studies, although there were precise criteria for the inclusion of studies that did not interfere with the calculation of the prevalence of adolescent pregnancy. Another limitation was related to the low quality of the studies, which made it impossible to comment on the results with certainty.

Conclusions

Given the prevalence of adolescent pregnancy, effective interventions are essential to reduce adolescent pregnancy and its consequences, ultimately contributing to the achievement of sustainable development goals. Recognizing patterns of prevalence in regions can can inform the development of strategies for managing the consequences of adolescent pregnancy in Eastern Mediterranean. By understanding the regional variations and tailoring interventions accordingly, policymakers and healthcare providers can more effectively address the unique challenges faced by different regions and work towards reducing the incidence of adolescent pregnancy.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12978-024-01856-4.

Supplementary material 1.

Author contributions

All authors contributed to concept of the study. M.V. and H.T. interpreted the data, conducted quality appraisals and was involved in manuscript development; H.A. and A.P. interpreted the data, conducted quality appraisals and drafted the manuscript; M.M. analysed and interpreted the data; All authors have read and approved the manuscript.

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Availability of data and materials

All the data can be obtained from the corresponding author upon a reasonable request.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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