



Review

Birth Defect as Teenage Pregnancy Complication: Narrative Review

¹Fauzan Achmad Maliki*, ²Tira Alfiani Laariya

Email (Corresponding Author) : * fauzan.achmad.m@mail.ugm.ac.id

¹ Department of Obstetrics and Gynecology, Faculty of Medicine Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta

²Department of Public Health, Faculty of Medicine, Universitas Ahmad Dahlan, Yogyakarta, Indonesia

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ABSTRACT

Due to its complexity in terms of psycho-social factors as well as maternity and maternal outcomes, teenage pregnancy is still a global issue that receives constant attention. The rate of adolescent fertility (AFR) in Indonesia is 34 births per 1000 women who are fertile in 2021. Birth defects are more common in teenage pregnancies than in adult pregnancies. This review article aimed to explore the issues of teenage pregnancy, particularly as they relate to congenital abnormalities or birth defect as complications of teenage pregnancy. Database searches were conducted on Pubmed and Google Scholar with specific keywords related to teenage pregnancy and birth defect. We gathered 11 articles from 2014 until 2023 with a wide variety of research designs in this review article. Teenage pregnancy led to maternal and newborn complications. Anemia, preeclampsia, and eclampsia, preterm delivery were the most frequent maternal complications, while low birth weight was the most frequent newborn complications in teenage pregnancy. Gastroschisis was the most prevalent birth defect associated with teenage pregnancy, but there was little research on the subject and even fewer comprehensive reviews.

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INTRODUCTION

Teenage pregnancy, commonly referred to as adolescent pregnancy, is defined as pregnancy between the ages of 10 and 19¹. Whether as a result of child marriage or sexual assault, the majority of teenage pregnancies are unintended². Studies show that teenage pregnancies can result in a range of difficulties, including birth, maternal, and newborn issues. Anemia, preeclampsia, eclampsia, early membrane rupture, and hemorrhage after delivery are the most

common problems that arise in teenage pregnancies for mothers³. Furthermore, according to certain research, one of the fetal complications of teenage pregnancy is a birth defect⁴.

Chen and colleagues conducted a study in 2022 that revealed that teenage pregnancies are more likely than adult pregnancies to result in birth defects related to the musculoskeletal system, the central nervous system, the gastrointestinal tract, and the integument. Underweight BMI and malnourishment are risk factors for deformities in cases of gastroschisis. Numerous other potential risk factors for birth defects in teenage pregnancies have been thoroughly examined and determined⁴.

Birth defects in teenage pregnancy are topic that is rarely reviewed and studied, especially in Indonesia. This review article aims to comment further on the incidence of birth defects in teenage pregnancy, especially in Indonesia, while also knowing the common types, whether chromosomal or non-chromosomal, in daily practice.

METHOD

Database explorations were conducted on Pubmed and Google Scholar. Keywords used were "teenage pregnancy or adolescent pregnancy", "birth defects or congenital malformation or congenital anomalies", "birth defects in teen pregnancy", "finding or incidence rate", and "Indonesia". We included articles from 2014 until 2023. We used the PICO method to screen the articles and we found: Population: Adolescent pregnant woman, Intervention: Birth defect, Comparison: Average Mother Age (AMA), Outcome: Incidence of Birth Defect in Indonesia. The inclusion criteria we used were

1. Adolescent pregnant woman aged <20 years old,
2. A study about the maternal condition in teenage pregnancy,
3. Incidence of Birth Defect/Risk of Birth defect,

The exclusion criteria applied in the present article are as follows: the manuscript is in conference poster form, full text not available, and editorial commentary review article.

RESULT

Database search on the Pubmed search engine with the keywords "teenage pregnancy or adolescent pregnancy" alone displayed approximately 858 articles within the last five years. However, when the keywords were detailed with the addition of "birth defects or congenital malformation or congenital anomalies" only 58 articles were without a timeframe added. We tried to use Google Scholar for some articles that were not fully available in Pubmed. In addition, we also used Google to access current government policies and data. We decided to use 11 articles

with various forms of study designs to be included in this review article. We did not add a specific timeframe because the number of studies that are relevant to the topic is still limited.

Table 1. Summary of Finding

References	Design	Findings	Maternal Complication OR/RR (95% CI)	Newborn Complication of OR/RR (95% CI)	Prevalence Birth Defect (BD)
Chen 2022	X, Cross sectional	An increased risk of multiple BDs was significantly correlated with teenage pregnancy	-	Neural Tube Defect (NTD) RR 3,15 (2,56-3,87) Gastroschisis RR 7,02 (5,09-9,69)	6,33%
Kang 2015	G, Cohort	A higher risk of prematurity, significant congenital malformations, and perinatal mortality was linked to younger maternal age	-	Low birth weight OR 2.91 (1.35-6.37) Prematurity OR 1.70 (1.18-2.43) Perinatal mortality OR 3.76 (1.26-10.32) Major congenital defects OR 4.68 (2.10-10.13)	3,4%
Karai 2019	A, Cross sectional	There was a significant correlation found between adolescent mothers and higher risk of congenital malformations, and low birth weight.	-	Neural tube defects Heart defects Single umbilical artery Gastroschisis Urogenital defects Musculoskeletal defects Tracheostenosis Supernumerary nipple	8%
Wong 2020	SPW, Cohort	Substance abuse during pregnancy, mental health issues, and socioeconomic disadvantage are all linked to teenage pregnancies.	-	Low apgar score OR 1,56 (1,21-2,02)	-
Sari 2022	RP, Review	The variables that were most closely linked to teenage pregnancy were knowledge, access to information, a young marriage, economic status, and educational attainment.	Preterm delivery Anemia Preeclampsia	Low birth weight	-

Indarti 2020	J,	Cross sectional	Teenage mother had higher rates of eclampsia, preterm delivery, anemia during labor, postpartum hemorrhage, and low birth weight (AOR: 2.28; 95% CI: 1.60–3.25).	Eclampsia OR: 4.03 (1.73–9.39) Preterm delivery OR: 1.5 (0.88–2.53) Anemia OR 2.42 (1.60–3.67) Postpartum hemorrhage OR 2.59 (0.86–7.37)	Low birth weight OR 2.28 (1.60–3.25)	-
Diabelková J, 2023		Cross sectional	Teenage mothers' babies typically had smaller birth weights, lower Apgar.	Preterm delivery	Low birth weight	-
Ganchimeg T, 2014		Cross sectional	Teenage mothers were more likely to experience maternal and newborn outcome	Systemic infections Maternal endometritis Preterm delivery	Low birth weight	-
Madjid 2014	OA,	Cross sectional	The most prevalent adverse event of teenage pregnancy were cephalopelvic disproportion; premature rupture of membranes; and caesarean surgery	Cephalopelvic disproportion Premature rupture of membranes Caesarean surgery	-	-
Csermely 2015	G,	Cohort	Teenage pregnancy had a higher risk of gastroschisis and heart anomaly		Gastroschisis OR 2.32 (1.13–4.77) Heart anomaly OR 1.51 (1.03–2.22)	
Ahn D, 2022		Systematic review	Teenage pregnancy had a higher risk of abdominal wall defect and oral cleft		Abdominal wall defect OR 2.15 (1.26–3.69) Oral cleft/lip defect OR 1.05 (1.01–1.10)	

The prevalence of birth defects in teenage pregnancies ranges from 340 to 800 per 10,000 births, according to three studies⁴⁻⁶. The birth defect known as gastroschisis has been identified as one that is highly correlated with teenage pregnancy (RR = 7.02; 95% CI [5.09-9.69]). Congenital cardiac diseases, polydactyly, neural tube defects, cleft lip with cleft palate, and gastroschisis were the five most prevalent subtypes of birth defects in teenage pregnancies. In all of them, the prevalence was 151, 27, 21, 12, and 10 per 10,000 births⁴.

DISCUSSION

Teenage Pregnancy

Teenage pregnancy is defined as pregnancy that occurs in adolescent girls aged 10-19 years. The World Health Organization states that teenage pregnancy is a global issue that affects both developed and developing nations. This is due to the complexity of psychosocial, maternal and fetal condition and outcomes. The rate of teenage pregnancies decreased globally in 2023, from 64.5 per 1000 births in 2000 to 41.3 per 1000 births. However, this decline is not expected to occur evenly across countries and states. According to estimates, 21 million teenage females become pregnant each year in developing nations, making teenage pregnancy rates remain very high¹.

Adolescent fertility rate (AFR) is at 43 births per 1,000 adolescent girls aged 15-19 years in Southeast Asia¹⁵. In 2021 Indonesian AFR is at 34 births per 1000 women of fertile age¹⁶. Indonesia now ranks first in AFR in Southeast Asia¹⁷. Teenage pregnancy is often associated with an unwanted pregnancy. However, in some regions, the cause of teenage pregnancy itself is early marriage, which has become a local tradition, making teenage pregnancy inevitable². Nowadays, the massive use of social media is like a double-edged sword in terms of teenage pregnancy. The use of social media can spread reproductive health education in the hope of improving knowledge and healthy behavior in adolescents. Nevertheless, on the other hand, the use of social media facilitates adolescents' easier access to pornographic content, sexual harassment behavior, and free sex, all of which can lead to teenage pregnancy⁸. Widyastari et al. reported that 7-11% of women in Indonesia gave birth to their first child prior to marriage¹⁸.

A wide range of conditions are reported as causes of teenage pregnancy: socio-economics and low education levels. The lower a person's education level, the higher the likelihood of teenage pregnancy^{7,9,10}. Effendi et al., in their qualitative study, mentioned that low access to reproductive health, social norms and local tradition, low education levels, poverty, and delinquency in adolescents are the causes of teenage pregnancy¹⁹. Ayuandini et al. stated that there are 6 pathways to teenage pregnancy. The six pathways are if it occurs in a marriage relationship, (1) economic problems in marriage, (2) maintaining the reputation of adolescent girls and families, (3) romantic relationships, and if pregnancy occurs outside of marriage, (4) consensual sex by adolescents, (5) unwanted, pressured sex, and (6) pressured sex². In addition, teenage pregnancy can also cause psychological problems. Teenage mothers have a higher likelihood of experiencing depression during pregnancy (9.8%) than the average mother age (5.8%)⁷. In addition to depression, other psychological problems such as anxiety disorders, eating disorders, and perinatal suicide can be experienced in teenage pregnant women²⁰.

Besides psycho-social problems, adolescence is an age where physical and mental maturity are still developing. Adolescence is the age when plasticity and brain development are taking place, including the frontal brain as an executive center or decision-making. This is the reason why teenagers often act based on emotions, not mature thinking²¹. In teenage pregnancies, this affects their decisions regarding nutrition intake, decisions to attend antenatal care (ANC), and later decisions at the time of delivery^{5,10}. Pregnancy and delivery during this age range can result in serious complications for both the mother and the child in the future because the person is not yet mentally and physically ready.

Complications in Teenage Pregnancy

Teenage pregnancy is a risky pregnancy due to the high probability of maternal and maternal outcome complications. Multiple studies have documented a range of complications associated with teenage pregnancy. In maternal complications, anemia and preeclampsia/eclampsia are the most commonly reported complications in teenage pregnancy^{8,9,11,22}. Meanwhile, low birth weight (LBW) and preterm labor are the most commonly reported maternal outcome complications^{6,8,9,11,22}.

Anemia is a major concern when 12 to 15-year-olds are pregnant (OR: 4.84; 95% CI [1.22–19.2])⁹. Anemia as a maternal complication in teenage pregnancies is associated with adolescent compliance in antenatal care attendance and economic status. Middle to lower economic capacity woman tend not to do an ANC on a regular basis, which also leads to a risk of other complications¹². Anemia is also a common condition in teenage girls, especially iron deficiency anemia⁸. Stephanie et al. reported determinants that were substantially linked to LBW. These determinants were maternal underweight BMI, previous history of preterm delivery, smoking, and marijuana use⁷. Kang reported that preterm delivery is also a frequent maternal outcome in teenage pregnancy (OR 1.70, 95% CI 1.18-2.43, $p < 0.01$)⁵. Research by Karai et al. reported that gestational diabetes is less common in teenage pregnancy⁶. There are other complications that can arise from teenage pregnancy, including birth defect, but there hasn't been a lot of research or reporting on this subject.

Birth Defect in Teenage Pregnancy

The birth defect is malformation of structural or functional during pregnancy²³. Compared to average mother-age pregnancy, teenage pregnancy carries a higher risk of birth defects. Csermely studies in Hungary mention a higher risk of hydrocephalus, anencephaly, omphalocele, gastroschisis, and polydactyly¹³.

Chen et al. mention an increased prevalence of birth defects from 247.19 to 387.73 per 10,000 births between 2012-2018 (*Ptrend* = 0.024) in teenage pregnancy. Chen et al. mentioned that teenage pregnancy is more often correlated with multiple malformations than pregnancy at a later age. Congenital Heart Disease (CHD), polydactyly, Neural Tube Disorders (NTDs), cleft lip with cleft palate, and gastroschisis are the most prevalent subtypes of birth defect in teenage pregnancies⁴. Eckmann-Scholz et al. reported gastroschisis to be the most frequent birth defect found in teenage pregnancy. Other birth defects such as hypoplastic left heart syndrome (HLHS), CHD, urogenital and skeletal malformations, and spina bifida were also reported in this study²².

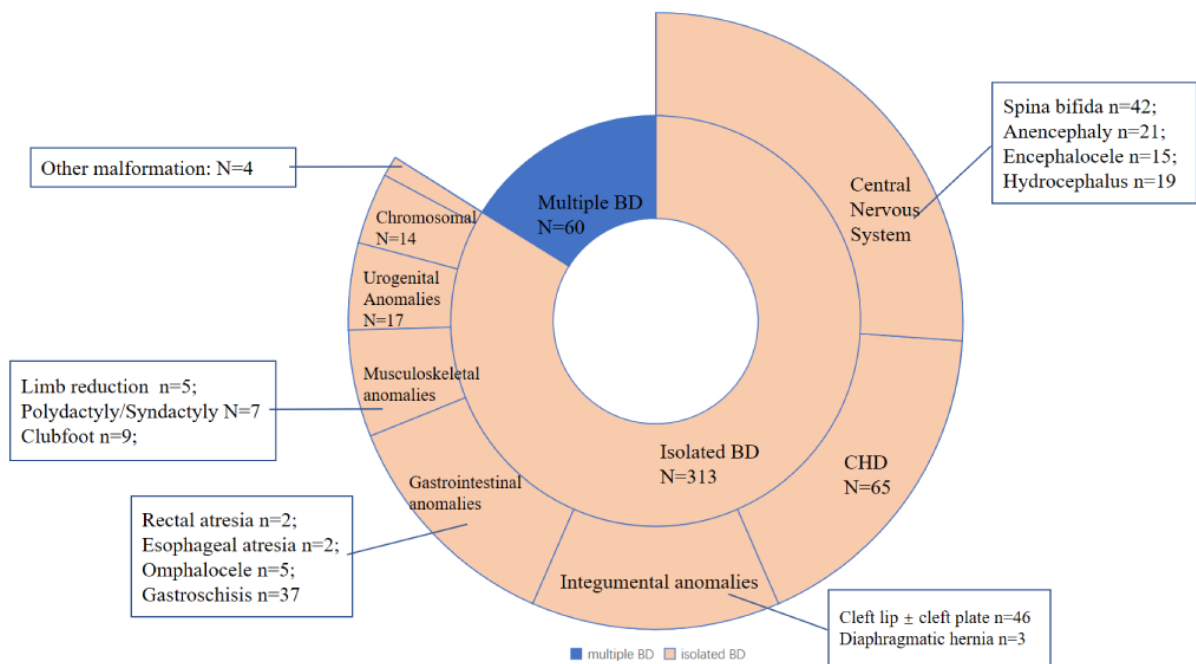


Figure 1. Pie-chart birth defect subtypes in teenage pregnancy ⁴
BD= birth defect

A meta-analysis stated that abdominal wall malformations in teenage pregnancy is higher than in pregnancy of mothers aged 20-34 years OR (2.15, CI 1.26-3.69)¹⁴. Several studies attempt to explain the possible causes of these abnormalities, but only a little literature is available.

Table 1. Risk of by organ system defects in teen pregnancy ¹⁴

Birth Defects	Odds Ratio (95%CI)
Abdominal wall	2.15 (1.26-3.69)
Digestive system	1.17 (0.89-1.55)
Central Nervous System	1.12 (0.92-1.37)
Limb and extremity	1.09 (0.88-1.36)
Oral cleft/lip	1.05 (1.01-1.10)
Heart	0.93 (0.79-1.10)
Urogenital	0.99 (0.81-1.20)
Diaphragmatic hernia	0.96 (0.87-1.06)

Weber et al. study tried to investigate potential risk factors for gastroschisis in teenage pregnancy. There was found a positive association between low iron intakes and the incidence of gastroschisis in teenage pregnancy. This study showed that the risk of gastroschisis in teenage pregnancy is influenced by dietary factors and diet-related behaviors²⁴. In another review, poor nutritional intake and unhealthy lifestyles, such as smoking and alcohol consumption, may lead to a high risk of gastroschisis²⁵. Multiple birth defects that occur in teenage pregnancy can also be influenced by the teenage father, where the probability of germline mutations and exposure to teratogens is increased at this age²⁶. Other possible cause is Germline de novo mutations (gDNMs) which are new mutations that have occurred within one generation, provide offspring with genetic variants in addition to those inherited from their parents. It accounts for nearly 90% of total DNMs²⁷. Mutation due to low intake of folate through epigenetic pathway can affect metabolic processes that regulate cell division and tissue development²⁸.

CONCLUSION

Teenage pregnancy is a pregnancy that occurs at a vulnerable age, thereby increasing the risk of possible complications. The most frequent maternal complications in teenage pregnancy are anemia, preeclampsia, and preterm delivery. The most frequent newborn complication is low birth weight. Teenage pregnancies frequently miss the recommended number of antenatal care visits, which raises the possibility of complications for both the mother and the newborn. Inadequate diet and an unhealthy lifestyle also contribute to a higher risk of complications during teenage pregnancy

The incidence of birth defects in teenage pregnancy is relatively higher than in average mother-age pregnancy. The prevalence of birth defects in teenage pregnancies ranges from 3,4% to 8%. Gastroschisis is the most prevalent birth defect in teenage pregnancy. Studies on birth defects in teenage pregnancy are still rare globally. To identify the determinants that contribute to birth defect in teenage pregnancy, more investigations is required.

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