

## Physical Intimate Partner Violence in Pregnant Women and its Risk on Low Birth Weight: A Meta-Analysis

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### ABSTRACT

**Background:** Intimate Partner Violence (IPV) is a significant public health problem that affects women, including pregnant women. During pregnancy, pregnant women experiencing IPV will have an impact on the health of the mother and fetus, including an increased risk of premature birth and low birth weight babies. This study aims to analyze and estimate the influence of physical intimate partner violence in pregnant women on low birth weight infants.

**Subjects and Method:** Meta-analysis was carried out according to the PRISMA flow diagram and PICO Model. Population: pregnant women, Intervention: Intimate partner violence, Comparison: No intimate partner violence, Outcome: low birth weight babies. Search for articles in this research through databases including PubMed, Google Scholar, ScienceDirect by selecting articles published in 2015-2023. With the keywords "Intimate Partner Violence" OR "Domestic Violence" AND "Low Birth Weight" AND "Pregnancy" AND "Adjusted Odds Ratio". Inclusion criteria are full paper articles with an observational study design, articles are in English.

**Results:** Nine studies of cohort and cross-sectionals were included for meta-analysis. Meta-analysis of 5 cohort studies showed that physical intimate partner violence in pregnant women increased the risk of infants low birth weight (aOR= 3.66; 95% CI= 2.31 to 5.79; p<0.001). Meta-analysis of 4 cross-sectional studies showed that physical intimate partner violence in pregnant women increased the risk of infants low birth weight (aOR= 3.60; 95% CI= 2.05 to 6.32; p< 0.001).

**Conclusion:** Physical intimate partner violence in pregnant women increases the risk of infants with low birth weight.

**Keywords:** intimate partner violence, pregnant women, low birth weight.

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### BACKGROUND

Physical, sexual, emotional violence against women is a major violation of human rights

and a global public health problem (Alhusen et al., 2015). The world health organization defines Intimate Partner Violence (IPV) as

referring to a pattern of behavior of an intimate partner or former partner that results in physical, sexual or psychological harm, including physical assault, sexual abuse, psychological pressure and controlling behavior (WHO, 2022). Intimate Partner Violence (IPV) includes various types such as physical violence, the deliberate use of physical force to hurt a partner such as kicking, hitting, sexual violence, an attempt to force a partner to take part in sexual activities where the partner does not consent, psychological violence, an attempt to scare, threatening, insulting and social control (Demelash et al., 2015). Globally, WHO estimates that around 1 in 3 (30%) women worldwide have been subjected to physical and/or sexual violence by an intimate partner or non-partner sexual violence in their lifetime (WHO, 2022).

Eliminating all forms of violence against women is one of the 2030 sustainable development goals (SDG), namely to achieve gender equality and empower all women. IPV is a global health problem that can pose a greater risk of physical, sexual and psychological health problems, and has an impact on all aspects of women's lives such as self-esteem, productivity, ability to care for themselves, ability to care for children, and ability in social activities (Adhena et al., 2020). Intimate Partner Violence (IPV) also has a negative impact on reproductive health, disrupted pregnancy, unwanted pregnancy, increases the risk of sexually transmitted diseases and/or Human Immunodeficiency Virus (HIV) (WHO, 2013).

Pregnancy was identified as a vulnerability for increased risk of exposure to violence. IPV in pregnancy has a negative impact on the health of the mother and baby including premature birth, low birth weight, miscarriage, pyelonephritis, urinary tract infections, cesarean delivery, antepartum

hemorrhage, emotional stress and postpartum depression (Berhanie et al., 2019). The global prevalence of IPV during pregnancy according to WHO ranges from 1% to 28%. Additionally, the overall prevalence of IPV during pregnancy in developing countries is higher (27.7%) than in developed countries (13.3%) (Azene et al., 2019).

Intimate Partner Violence (IPV) contributes to adverse impacts on pregnant women and the development of neonates including an increased risk of premature birth, low birth weight babies, spontaneous abortion and neonatal death as a direct result of blunt force trauma to pregnant women (Chen et al., 2017). Studies report that low birth weight babies are a sign of poor fetal condition due to impaired growth in the womb which is influenced by exposure to stress due to IPV. Pregnant women who are exposed to stress will increase the sensitivity of the induction of HPA (Hypothalamus Pituitary Adrenal) hormone secretion. High levels of the HPA hormone will affect the cortisol hormone which results in narrowing and compression of the blood vessels to the uterus. This can inhibit fetal growth and can cause premature birth as one of the causes of low birth weight babies (Rahman et al., 2022).

A number of studies state that IPV during pregnancy increases the risk of low birth weight babies and premature birth. Low birth weight babies and premature birth are the main causes of neonatal morbidity and mortality. Babies born with a body weight of <2,500 grams are called low birth weight babies, while babies born before 37 weeks are called premature babies (Bailey et al., 2010). Low birth weight babies often occur together with premature birth. Short-term and long-term effects associated with low birth weight babies, for example, are very susceptible to infection, malnutrition, poor cognitive development,

higher risk of stunting at the age of two years, short height, decreased immune system, risk of chronic disease, complications reproduction and low productivity in education and the economy (Belay et al., 2022). Long-term health risks associated with low birth weight include type 2 diabetes, hypertension, cardiovascular disease and obesity (Ferdos et al., 2017).

## SUBJECTS AND METHOD

### 1. Study Design

This research is a systematic review and meta-analysis. Article search using Google Scholar, Pubmed, ScienceDirect databases. The keywords used in this study are “Intimate Partner Violence” OR “Domestic Violence” AND “Low Brith Weight” AND “Pregnancy” AND “Adjusted Odds Ratio”.

### 2. Steps of Meta-Analysis

- 1) Formulate PICO format research questions (Population, Intervention, Comparison, Out come).
- 2) Search for primary study articles from various databases such as PubMed, Google Scholar, ScienceDirect.
- 3) Conduct screening to determine inclusion and exclusion criteria and conduct critical appraisal of primary studies with checklists for cohort and cross-sectional.
- 4) Extract primary study results data and synthesize effect estimates using the RevMan 5.3 application.
- 5) Interpret the results and draw conclusions.

### 3. Inclusion Criteria

Full-text paper research article with observational study design, analysis using multivariate adjusted Odds Ratio (aOR), the subjects are pregnant women, intimate partner violence intervention, outcome of low birth weight babies.

### 4. Exclusion Criteria

Articles published before 2015, published articles that have undergone meta-analysis,

statistical results in the form of bivariate analysis.

### 5. Definition of Operational Variable Intimate Partner Violence (IPV) among pregnant woman

is violence that occurs in pregnant women which generally occurs in households in all social classes.

**Low birth weight** is the weight of the baby who is weighed after 1 hour of birth and weighs <2,500 grams.

### 6. Instrument of the Study

The quality assessment of the main article in this study used Primary Study Quality Assessment for Cross-Sectional and Cohort study design in Meta-Analysis Research sourced from the Public Health Masters Program at Sebelas Maret University Graduate School (Munawaroh and Murti 2023).

### 7. Data Analysis

The articles in this study were collected using PRISMA diagrams and analyzed using the Review Manager 5.3 (RevMan5.3) application by calculating effect size and heterogeneity ( $I^2$ ) to determine the combined research model and form the final results of the meta-analysis research. The results of data analysis are presented in the form of forest plots and funnel plots.

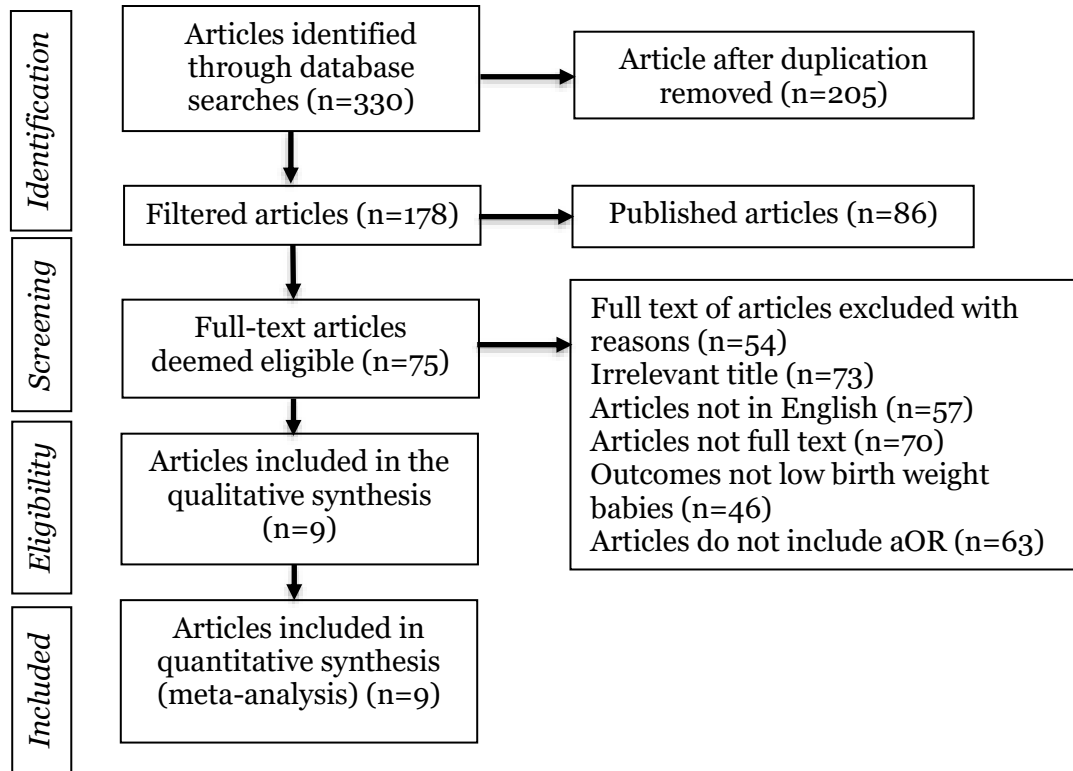
## RESULTS

The search process for primary articles related to the influence of Physical Intimate Partner Violence in Pregnant Women on LBW Babies in this meta-analysis study was carried out in several databases and the results obtained were 9 articles which can be seen in Figure 1 of PRISMA Flow Diagram. The total number of articles in the initial search process was 330 articles. After carrying out the process of deleting published articles, researchers found 178 articles, of which 75 articles met the full text review requirements. Next, 9 articles that met the quality assessment were included in a quantitative synthesis using meta-

analysis.

Figure 2 shows the regional distribution of the 9 primary articles used in this study,

namely 6 studies from the African continent and 3 studies from the Asian continent.



**Figure 1. PRISMA Flow Diagram of the influence of physical Intimate partner violence in pregnant women on LBW babies**



**Figure 2. Map of the research area on the influence of physical Intimate partner violence in pregnant women on LBW babies**

**Table 1. Results of a critical appraisal of the quality of a cohort study on the influence of physical intimate partner violence in pregnant women on LBW babies**

Primary Study	Questions Criteria														Total
	1a	1b	1c	1d	2a	2b	3a	3b	4a	4b	5	6a	6b	7	
Sigalla et al. (2017)	2	2	2	2	2	2	2	2	2	1	2	2	2	2	27
Laelago et al. (2017)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	28
Abdollahi et al. (2015)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	28
Getnet et al. (2023)	2	2	2	2	2	2	2	2	2	2	1	2	2	2	27
Belay et al. (2022)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	28

Description: Yes=2, Uncertain=1, No=0

Table 1 showed the results of the critical appraisal of primary research used for this study. Primary research quality assessment in this study was carried out using Primary Research Quality Assessment for cohort observational research designs in meta-analysis research using a checklist sourced from the Master’s of Public Health Program, Postgraduate School, Sebelas Maret University (Munawaroh and Murti, 2023).

Based on the research quality assessment, the lowest total score was 27 and the highest score was 28 and all articles were more than 24, which showed that each study has good quality so it can be included in the meta-analysis.

**Description of question criteria for cohort studies:**

**1. Formulation of research questions in the PICO acronym**

- a. Is the population in the primary study the same as the population in the PICO meta-analysis?
- b. Is the operational definition of exposure/intervention in the primary study the same as the definition intended in the meta-analysis?
- c. Is the comparison used in the primary study the same as that planned in the meta-analysis?
- d. Are the outcome variables examined in the primary study the same as those planned in the meta-analysis?

**2. Methods for selecting research subjects**

- a. Does the target population and accessible population not experience the outcomes studied at the start of the study?
- b. Is there a distinction between exposed groups and unexposed groups in cohort studies?

**3. Methods for measuring intervention and outcome variables**

- a. Are the exposure/ intervention and outcome variables measured with the same instruments (measuring tools) in all primary studies?
- b. If the variable is measured on a categorical scale, are the cut-offs or categories used the same across primary studies?

**4. Design-related bias**

- a. Is there no possibility of "Loss-to Follow-up bias" in primary studies?
- b. Have primary study researchers made efforts to prevent or overcome such bias? (e.g. choosing highly motivated subjects)

**5. Methods to control confounding**

Have primary study researchers used appropriate methods to control the influence of confounding?

**6. Statistical analysis methods**

- a. Does the researcher analyze the data in this primary study using a multivariate analysis model? (eg: linear regression analysis)
- b. Does the primary study report effect sizes or associations resulting from the multivariate analysis? (eg: adjusted OR)

**7. Conflict of interest**

Is there a conflict of interest with the research

sponsor?

**Assessment instructions**

1. Total number of questions = 14 questions. Answer "Yes" to each question gives a score of "2". The answer "Undecided" gives a score of "1". The answer "No" gives a score of "0".
2. Answer "Yes" to each question gives a score of "2".

3. Maximum total score= 14 questions x 2= 28.
4. Minimum total score= 14 questions x 0= 0. So the total score range for a primary study is between 0 and 28.
5. If the total score of a primary study is >=24, then the study can be included in the meta-analysis. If the total score of a primary study was <24, then the study was excluded from the meta-analysis.

**Table 2. Results of a critical appraisal of the quality of a cross-sectional study on the influence of physical intimate partner violence in pregnant women on LBW babies**

Author (Year)	Questions Criteria													Total
	1a	1b	1c	1d	2a	2b	3a	3b	4	5	6a	6b	7	
Alemu et al. (2019)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
Laelago et al. (2017)	2	2	2	2	2	1	2	2	2	2	2	2	2	25
Boah et al. (2023)	2	2	2	2	2	2	2	2	1	2	2	2	2	25
Ferdos et al. (2017)	2	2	2	2	2	2	2	2	2	2	2	2	2	26

Table 2 showed the results of the critical appraisal of primary research used for this study. Primary research quality assessment in this study was carried out using Primary Research Quality Assessment for cross-sectional observational research designs in meta-analysis research sourced from the Master’s of Public Health Program, Post-graduate School, Sebelas Maret University (Munawaroh and Murti, 2023).

Based on the assessment of research quality, the lowest total score was 25 and the highest score was 26 and all articles were more than 22, which showed that each study has good quality so it can be included in the meta-analysis.

**Description of question criteria for Cross-sectional studies**

**1. Formulation of research questions in the PICO**

- a. Is the population in the primary study the same as the population in the PICO meta-analysis?
- b. Is the operational definition of exposure/ intervention in the primary study the

same as the definition intended in the meta-analysis?

- c. Is the comparison used in the primary study the same as that planned in the meta-analysis?
- d. Are the outcome variables examined in the primary study the same as those planned in the meta-analysis?

**2. Methods for selecting research subjects**

- a. In analytical cross-sectional studies, do researchers choose samples from the population randomly (random sampling)?
- b. As an alternative, if in a cross-sectional analytical study the sample is not selected randomly, does the researcher select the sample based on outcome status or based on intervention status?

**3. Methods for measuring intervention and outcome variables**

- a. Are the exposure and outcome variables measured with the same instruments (measuring tools) in all primary studies?
- b. If the variable is measured on a categorical scale, are the cutoffs or categories used the same across primary studies?

**4. Design-related bias**

If the sample was not selected randomly, has the researcher made efforts to prevent bias in selecting research subjects?

**5. Methods to control confounding**

Have primary study researchers made efforts to control the influence of confounding?

**6. Statistical analysis methods**

- a. Does the researcher analyze the data in this primary study using a multivariate analysis model? (eg: multiple linear regression analysis)
- b. Does the primary study report effect sizes or associations resulting from the multivariate analysis? (eg: adjusted OR)

**7. Conflict of interest**

Is there a conflict of interest with the research

sponsor?

**Assessment instructions**

- 1. Total number of questions = 13 questions. Answer "Yes" to each question gives a score of "2". The answer "Undecided" gives a score of "1". The answer "No" gives a score of "0".
- 2. Maximum total score= 13 questions x 2= 26.
- 3. Minimum score= 13 questions x 0= 0. So, the total score range for primary studies is between 0 and 26.
- 4. If the total score of a primary study is  $\geq 22$ , then the study can be included in the meta-analysis. If the total score of a primary study was  $< 22$ , then the study was excluded from the meta-analysis.

**Table 3. Primary studies of the influence of physical intimate partner violence on pregnant women included in the meta-analysis**

Author (Year)	Country	Study Design	Sample	Population (P)	Intervention (I)	Comparison (C)	Outcome (O)
Sigalla et al. (2017)	Africa	Cohort	1123	13-24 weeks pregnant women	Physical IPV	No Physical IPV	LBW
Laelago et al. (2015)	Vietnam	Cohort	1276	24 weeks pregnant women	Physical IPV	No Physical IPV	LBW
Abdollahi et al. (2015)	Iran	Cohort	1461	Pregnant woman has just given birth	Physical IPV	No Physical IPV	LBW
Getnet et al. (2023)	Ethiopia	Cohort	142	28 weeks pregnant women	Physical IPV	No Physical IPV	LBW
Belay et al. (2022)	Ethiopia	Cohort	505	25-34 weeks pregnant women	Physical IPV	No Physical IPV	LBW
Boah et al. (2023)	Ghana	Cross-sectional	402	Pregnant women give birth in 6-12 months	Physical IPV	No Physical IPV	LBW
Laelago et al. (2017)	Ethiopia	Cross-sectional	195	Pregnant woman has just given birth	Physical IPV	No Physical IPV	LBW
Ferdos et al. (2017)	Bangladesh	Cross-sectional	400	Pregnant woman has just given birth for 3 days	Physical IPV	No Physical IPV	LBW
Alemu et al. (2021)	Africa	Cross-sectional	341	Pregnant woman has just given birth	Physical IPV	No Physical IPV	LBW

**The effect of physical intimate partner violence in pregnant women on LBW babies**

Based on Table 3, a description of primary research on the influence of physical intimate

violence in pregnant women on LBW babies, a meta-analysis of 9 articles was carried out with two study designs, namely a cohort study design and a cross-sectional study design. The research subjects were pregnant

women. The intervention provided was physical intimate partner violence compared to not experiencing physical intimate partner violence resulting in LBW babies. In this study, there were differences in the number of samples used in the study design, the

smallest cohort was 142 and the largest sample was 1,461, with a total sample of 4,507 pregnant women. In the cross-sectional study design, the minimum number was 195 and the largest sample was 402, the total sample was 1,338 pregnant women.

**Table 4. Adjusted odds ratio (aOR) and 95% Confidence Interval (CI95%) The effect of physical intimate partner violence in pregnant women on LBW babies**

Author	Year	aOR	Lower Limit	Upper Limit
Alemu et al. (2019)	2019	2.10	3.90	1.10
Abdollahi et al. (2015)	2015	2.90	4.40	1.92
Sigalla et al. (2017)	2017	3.20	7.70	1.30
Getnet et al. (2023)	2023	1.84	4.72	0.71
Ferdos et al. (2017)	2017	3.01	5.81	2.35
Boah et al. (2023)	2023	3.12	6.84	1.42
Laelago et al. (2017)	2017	14.3	40.7	5.10
Hoang et al. (2016)	2016	5.70	14.9	2.20
Belay et al. (2022)	2022	7.80	17.7	3.40

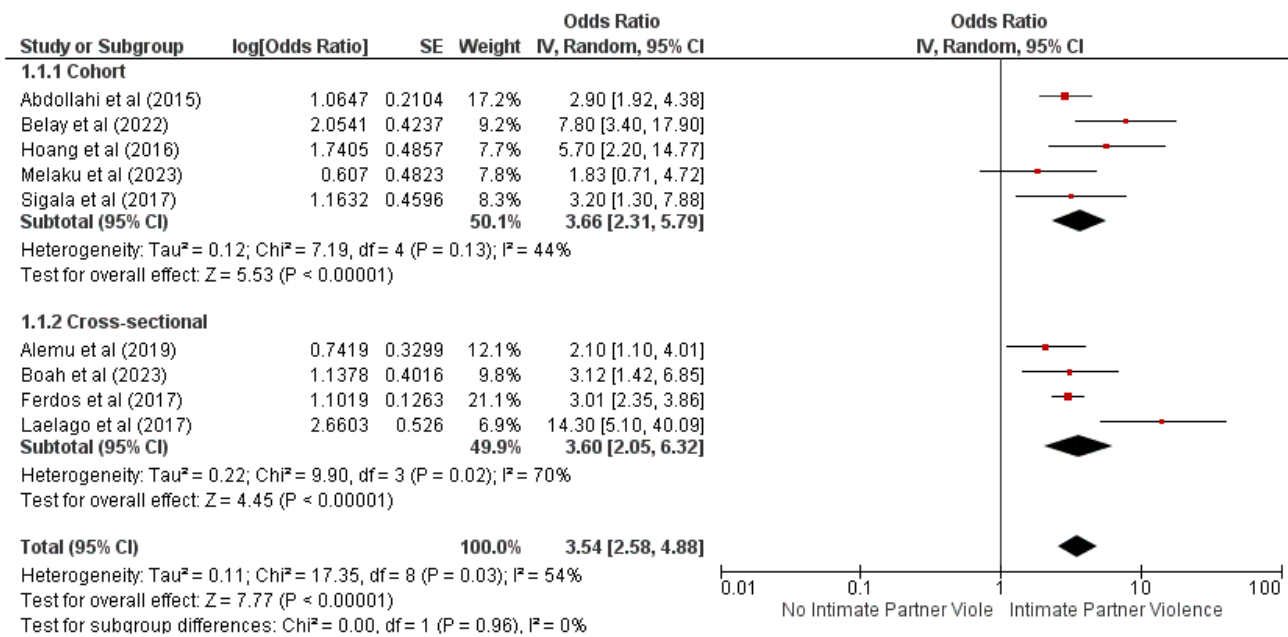
Table 4 lists the statistical summary results of effect estimates with the highest aOR value in the cohort study design which is 14.3 and the lowest aOR value is 1.84. The 95% CI with the largest range is 5.10 to 40.7, while the smallest range is 0.71 to 4.72. The extracted primary research data was then subjected to quantitative meta-analysis synthesis using RevMan 5.3 software.

The forest plot in Figure 3 shows that the results of the subgroup analysis in the cohort study of pregnant women with intimate partner violence had a 3.66 times increased risk of LBW babies compared to pregnant women who did not experience intimate partner violence and was statistically significant ( $p < 0.001$ ). Heterogeneity of research data shows  $I^2 = 44\%$ . Meanwhile, the results of a subgroup analysis of a cross-sectional study of pregnant women with intimate partner violence had a 3.60 times

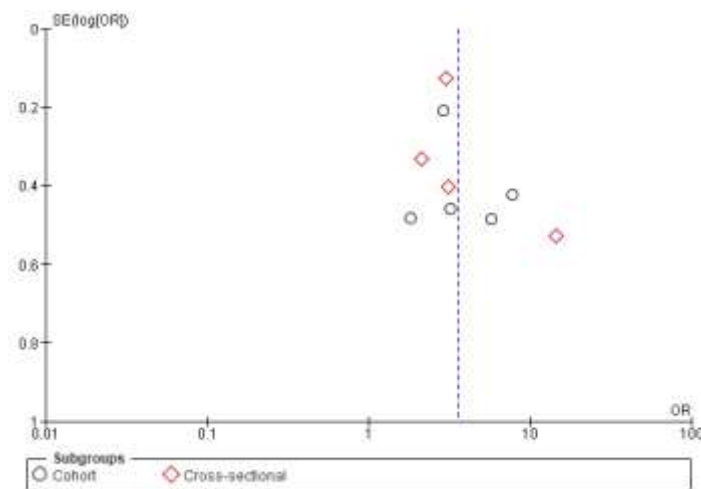
increased risk of LBW babies compared to pregnant women who did not experience intimate partner violence and was statistically significant ( $p < 0.001$ ). Heterogeneity of research data shows  $I^2 = 70\%$ . Heterogeneity of research data  $I^2 = 54\%$  so that the data distribution is declared heterogeneous (random effect model).

A funnel plot is a plot that describes the estimated effect size of each study against its estimate of accuracy which is usually the standard error. Based on the image, the cohort study does not show any publication bias as indicated by the symmetry of the right and left plots. Where there are 3 plots on the left and 2 plots on the right. The cross-sectional study also shows that there is no publication bias, which is indicated by the symmetry of the distribution of the right and left plots, where there are 3 plots on the left and 1 plot on the right.





**Figure 3. Forest plot of the effect of physical intimate partner violence in pregnant women on LBW babies**



**Figure 4. Funnel Plot of the effect of physical intimate partner violence in pregnant women on LBW babies**

## DISCUSSION

The research results from 9 observational research articles consisting of 5 cohort studies and 4 cross-sectional studies as a source of meta-analysis of the influence of intimate partner violence on LBW babies. The results of the forest plot of research articles with an observational cohort design using subgroup analysis show that pregnant women with

intimate partner violence have a 3.66 times higher risk of giving birth to LBW babies compared to pregnant women who do not experience intimate partner violence and this is statistically significant (aOR= 3.66; 95% CI = 2.31 to 5.79; p<0.001).

Meanwhile, research articles with cross-sectional studies using subgroup ana-

lysis show that pregnant women with intimate partner violence have a 3.60 times risk of giving birth to LBW babies compared to pregnant women who do not experience intimate partner violence and this is statistically significant (aOR=3.60; 95% CI= 2.05 to 6.32;  $p < 0.001$ ). In conducting subgroup analysis, researchers found no significant differences between cohort and cross-sectional studies ( $p = 0.950$ ).

The results of this study are supported by research conducted by Abebe Alemu which showed that pregnant women with intimate partner violence are at risk of giving birth to LBW babies (aOR=2.1; CI95%=1.1 to 3.9). In Ethiopia, pregnant women who do not work and live in rural areas are reported to experience intimate partner violence more often than working mothers who live in urban areas. Pregnant women with unplanned pregnancies and who do not receive adequate antenatal care are more likely to experience intimate partner violence which will give bad outcomes from the pregnancy, such as giving birth to a LBW baby.

Another study is conducted by Ferdos and Rahman (2017) entitled "Maternal Experience of Intimate Partner Violence and Low Birth Weight of Children: A Hospital-Based Study in Bangladesh". This research involved 400 pregnant women who had given birth at the Rajshahi Hospital in Bangladesh, where during their pregnancy they experienced intimate partner violence. The forms of IPV during pregnancy namely physical violence, sexual violence, and both physical and sexual violence. The results of this study were 43% of women experienced physical violence, 35.5% experienced sexual violence, 32.5% experienced physical and sexual violence. Physical violence poses a risk of giving birth to a LBW baby (aOR= 3.01; CI 95%= 2.35 to 5.81).

Other research states that pregnant

women who experience intimate partner violence are at risk of giving birth to LBW babies (aOR= 3.20; 95% CI= 1.3 to 7.7). Pregnancy is a stressful life event, and the presence of other stressful life events such as intimate partner violence will have a negative impact on pregnancy outcomes such as low birth weight babies (Sigalla et al., 2017).

Intimate partner violence during pregnancy is associated with adverse birth outcomes that will impact long-term and short-term health. The risk of being born with a low birth weight is a short-term risk. According to Tariku Laelago, children with a history of low birth weight due to the long-term effects of intimate partner violence generally have cognitive deficits such as motor delays, cerebral palsy, academic difficulties, speech delays, behavioral difficulties and psychological problems. Women who report physical, sexual, and emotional abuse problems are more likely to experience abnormal labor progress, premature rupture of membranes, low birth weight babies.

A study states that violence by an intimate partner during pregnancy will cause stress which will increase norepinephrine and cytokine levels. This causes the blood vessels of the uterus and placenta to become blocked and narrow. Long-term vasoconstriction will make it difficult for oxygen and nutrients to reach the fetus. So, it has the potential to result in IUGR and low birth weight (Boah et al., 2023).

Fetal birth weight is an indicator of intrauterine growth which is the result of genetics, environmental and social factors. Birth weight is determined as the first weight a newborn acquires after birth, ideally measured as soon as possible after birth to avoid slight postnatal weight loss (Laelago et al., 2017).

The World Health Organization (WHO) defines LBW as a birth weight <2,500 grams (5.5 pounds) regardless of

gestational age. LBW can be the result of premature birth or growth disorders. Babies with low birth weight have a higher risk of wasting, stunting and being underweight during childhood. Several studies show that women who experience IPV during pregnancy have an 18% higher chance of giving birth to a LBW baby (Alemu et al., 2019).

#### **AUTHOR CONTRIBUTION**

Diyah Nawangwulan as the main researcher who selected topics, searched and collected the data. Eti Poncorini Pamungkasari and Bhisma Murti analyzed the data and reviewed research documents.

#### **FUNDING AND SPONSORSHIP**

This study used personal funds.

#### **CONFLICT OF INTEREST**

There was no conflict of interest in this study.

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