

# Risk of Adolescent Pregnancy toward Maternal and Infant Health in Indonesia

## Risiko Kehamilan Remaja terhadap Kesehatan Ibu dan Bayi di Indonesia

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### Abstract

Impact of adolescent pregnancy is closely related to risk of maternal and infant health. This study aimed to develop composite maternal index, infant index, and analyze impact of adolescent pregnancy on maternal and infant health. This study used Indonesian Health Demographic Survey 2012 data with a sample of 2,167 respondents qualified for inclusion (women of childbearing age giving birth to their first child since January 2007 until the survey was conducted). Analysis used Polychoric Principal Component Analysis to produce composite index of maternal and infant health, and logistic regression to determine relation of adolescent pregnancy to maternal and infant health. Results showed that index of maternal health can be determined by indicator maternal morbidity, access to health care, and health behaviors. Infant health index can be determined by infant morbidity and nutritional status indicators. Adolescents with higher education level had 5.4 times higher risk (95% CI = 1.3 – 22.0) to have worse maternal health than adult pregnancies. Adolescent pregnancy had a risk 1.3 times (95% CI = 0.9 – 1.7) to have worse infant health than adult pregnancies after controlled by occupation, socioeconomic, and region. In conclusion, the risk of adolescent pregnancy on maternal and infant health is worse than adult.

**Keywords:** Adolescent pregnancy, infant health index, maternal health index

### Abstrak

Dampak kehamilan pada remaja erat kaitannya dengan risiko kesehatan ibu dan bayi. Penelitian ini bertujuan untuk mengembangkan komposit indeks kesehatan ibu, indeks kesehatan bayi dan untuk menelaah pengaruh kehamilan remaja terhadap kesehatan ibu dan bayi. Penelitian ini menggunakan data Survei Demografi Kesehatan Indonesia tahun 2012, dengan sampel 2.167 responden yang memenuhi syarat inklusi (wanita usia subur yang pernah melahirkan anak pertama sejak Januari 2007 sampai survei dilaksanakan). Analisis menggunakan *Polychoric Principal Component Analysis* untuk menentukan komposit indeks kesehatan ibu dan bayi, serta regresi logistik untuk mengetahui besar hubungan kehamilan remaja terhadap kesehatan ibu dan bayi. Kesehatan ibu dapat ditentukan melalui indikator status kesakitan ibu, akses layanan kesehatan, dan perilaku kesehatan. Kesehatan bayi dapat ditentukan melalui indikator status kesakitan bayi dan status gizi bayi. Kehamilan remaja dengan status pendidikan tinggi memiliki risiko kesehatan ibu lebih buruk 5,4 kali (95% CI = 1,3– 22,0) dibandingkan pada kehamilan dewasa. Kehamilan remaja memiliki risiko kesehatan bayi lebih buruk 1,3 kali (95% CI = 0,9 – 1,7) dibandingkan kehamilan dewasa setelah dikontrol oleh pekerjaan, sosial ekonomi, dan wilayah. Penelitian ini menyimpulkan bahwa risiko kehamilan remaja pada kesehatan ibu dan bayi lebih buruk dibandingkan usia dewasa.

**Kata kunci:** Kehamilan remaja, indeks kesehatan ibu, indeks kesehatan bayi

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## Introduction

Maternal and infant are susceptible to the health problems. This refers to the health of women during pregnancy, childbirth and the postpartum period, also the children growth period. The susceptibility of the health of maternal and infant becomes a reason why the efforts of keeping their health are important to be the priority of development. The success of the efforts of maternal and infant health can be viewed from the indicators of maternal mortality rate (MMR), infant mortality rate (IMR) and neonatal mortality rate (NMR).<sup>1</sup>

The community-based research in developing countries suggested the increasing risk of maternal mortality in adolescents, though the estimation of the rate is vary. A study in the United State of America (USA) suggested the mortality risk in adolescents is lower than in adults.<sup>2</sup> Besides, in the United Kingdom (UK) and Canada, the ratios of mortality of mothers aged under 20 years old are higher than among 20-24 years old, still lower than those aged  $\geq 25$  years old.<sup>3,4</sup> Otherwise, the data of Australia show that the mortality ratio of under 20-year-old mothers is higher than those separated age groups of above 40 years old.<sup>5</sup> Several data of both developing and developed countries also suggested that mortality risk increased among those under 15-year-old adolescents than those aged 15-19 years old.<sup>6</sup> In Indonesia, based on Indonesia Demographic and Health Survey (IDHS) 2012 maternal mortality data in adolescent mother has increased from 0.08 per 1,000 women exposed in 2002 to 0.10 per 1,000 women in 2007 and 0.13 per 1,000 women in 2012.

At the risk of infant mortality, the study in Sweden showed that the increasing of fetal and infant mortality varied inversely as the age of the mother. Neonatal mortality risk for mothers aged 13-15 years old is three times higher than those aged 20-24 years old. While, the neonatal risk increased by 70% in mothers aged 16-17 years old.<sup>7</sup> IMR in the USA is much higher among mothers  $\leq 15$  years old (8.1 per 1,000 live births) than those aged 16-17 years old (6.3 per 1,000 live births) and for 18-19 years old (5.4 per 1,000 live births). Even after being adjusted with the risk factor that dealing with the bad behaviours, including consuming alcohol, tobacco, and prenatal care, the infant mortality risk is still 1.6 times higher for the mothers aged  $\leq 15$  years old than those aged 18-19 years old.<sup>8</sup> In Indonesia, based on IDHS data, NMR has increased from 2007 to 2012. There are 30 deaths per year 1,000 live births to 34 deaths per 1,000 live births.

The study in the United Kingdom in 2012 suggested that the adolescents had worse health behaviour during pregnancy than the women aged  $\geq 25$  years old.<sup>9</sup> Besides, the study in Thailand in 2011 suggested that adolescent pregnancy related to the increasing of morbidity risks in-

cluding anaemia, low birth weight (LBW), intensive care unit (ICU) nursing and postpartum complication compared to 20-34-year-old mothers.<sup>10</sup> Meanwhile, the study in Indonesia in respect of health risk suggested that there is a significant correlation between adolescent pregnancy and prematurity, LBW, chronic energy deficiency, and anaemia.<sup>11,12</sup>

Evaluating the condition of maternal and infant health should be conducted comprehensively from correlated aspects. A method used is to create a health index. In Indonesia, health index has only been developed by Maryani *et al.*,<sup>13</sup> and still limited on provincial scale. Besides, the infant health index has not been developed yet in Indonesia.<sup>13</sup> According to the concept of Maryani *et al.*,<sup>13</sup> referring to the theory of McCarthy and Maine,<sup>14</sup> deciding maternal health index requires the developing of health index at individual scale. Otherwise, to evaluate the health of infant requires the developing of health index which has not been provided in Indonesia. Referring to the study by Osorio, Bolancé, & Alcañiz,<sup>15</sup> based on the theory of Solar and Irwin,<sup>16</sup> in respect of making health index of early childhood, suggested that it is necessarily to be established in Indonesia. The establishing of maternal and infant index aims to know the description of the health of maternal and infant in Indonesia. Further, the index developing would be used to determine the risk of adolescent pregnancy toward maternal and infant health.

## Method

This study applied a cross-sectional study design by using data from 2012 IDHS. The samples taken were women of childbearing age who had given birth in 2007-2012. The number of samples was 2,167 respondents. There were two dependent variables that were maternal health and infant health.

Maternal health indicators derived from a composite variable maternal morbidity status, access to health care, and health behaviours. While the infant health was depicted from the indicators of infant morbidity status and infant nutritional status. The independent variables consisted of the categories of maternal age, marital status, education, occupation, socioeconomic and region. Analysis of composite maternal index and infant index used Polychoric Principal Component Analysis (PCA). Polychoric PCA is part from factor analysis consisting of categorical scale variable and multivariable logistic regression to determine the relation of adolescent pregnancy with maternal and infant health.

## Results

The samples of this study were 2,167 women of childbearing age who had given birth in the span of five years before the survey. The characteristics of the mother can

be seen on Table 1.

Based on the frequency distribution on Table 1, the percentage of adolescent pregnancy (< 20 years) was about 20% and adult (≥ 20 years) about 80%. Most of them were married (95.4%), had middle level of education (60.3%), employed (54.1%) and living in rural areas (51.1%).

Maternal health index was the compositing result of 13 variables consisting of four indicators, namely reproductive status, the status of maternal morbidity, access to health care, and health behaviors (Figure 1).

While the infant health index was determined by composite of five composite variables that are divided from two indicators, namely infant morbidity and infant nutrition. Based on Polychoric PCA analysis, the results can be seen in the Table 2.

Based on Table 2, Polychoric PCA analysis of the maternal component showed results that maternal morbidity of 60.5% could be explained by pregnancy compli-

ation variables and complications of labor. The variation of the 46.6% service access indicator could be explained by the maternal and child health book variable, vitamin A and provided information on pregnancy hazard during pregnancy. While on health behavior indicator, 36.8% variation of health behavior could be explained by tetanus immunization, iron consumption, antenatal care frequency, antenatal care with health workers, antenatal care at health service, delivery with health worker, delivery in health service, check after birth with health workers. Thus, the best indicator was an indicator of maternal morbidity status because it had the largest percentage.

While maternal health index composite consisted of all maternal status indicators, access to health service, and health behavior. There were several variables with very low coefficient value or very little effect. In this case, the smallest variable effect was complications of labor and vitamin A. The next step was to remove the variables with low coefficient value so as to obtain a health index that was able to explain the variation of the constituent variables to the maximum. Based on the final results with Polychoric PCA composite index, 32% of maternal health indices could be explained by the variable constituent. Maternal health index was categorized into two categories, namely health index which has positive and negative value.

Based on the results of Polychoric PCA analysis of infant components in Table 2, it can be seen that in the indicator of infant morbidity, 52.8% variation in infant morbidity could be explained by LBW and immunization status. While in the infant nutritional status indicator, 43.5% variation could be explained by the first breastfeeding variable, vitamin A, and iron. Based on the results of infant health composite index consisting of all variables that make up the infant morbidity and infant nutri-

Table 1. Frequency Distribution Characteristics of Respondents

Variable	Category	Total	Percentage
Age category during pregnancy	Adolescent	434	20.0%
	Adult	1733	80.0%
Marital status	Married	2068	95.4%
	Single	99	4.6%
Education	Never / basic	454	20.9%
	Middle	1306	60.3%
	High	407	18.8%
Occupation	Employed	1172	54.1%
	Unemployed	995	45.9%
Socioeconomic	Very poor	453	20.9%
	Poor	484	22.3%
	Middle	431	19.9%
	Rich	454	21.0%
Region	Very rich	345	15.9%
	Urban	1060	48.9%
	Rural	1107	51.1%

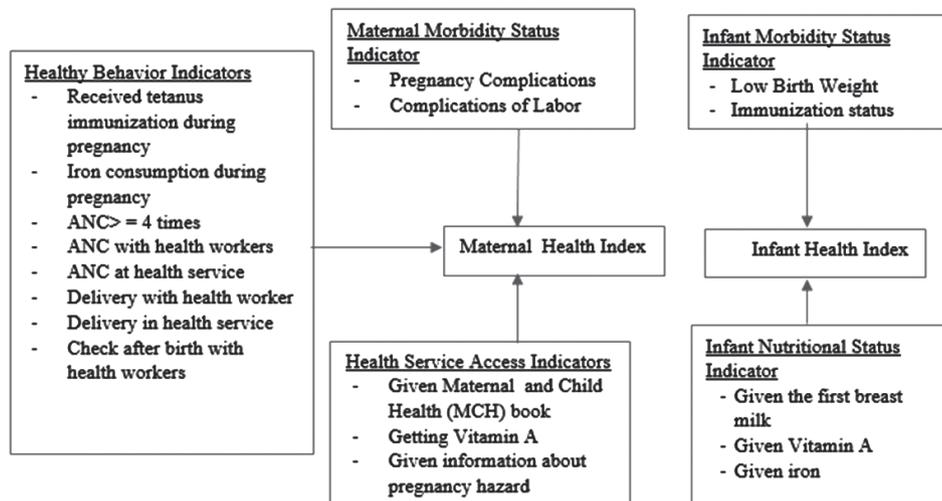


Figure 1. Maternal and Infant Health Index Structure Composite

tional status, it can be seen that 31.8% variation of infant health index could be explained by status variables LBW, immunization, first breastfeeding, vitamin A, and iron. Among the two indicators, the infant health status indicator was a better indicator of nutrition as it had a higher percentage. The result of infant health index obtained was categorized into two, namely health index which has positive and negative value.

Based on the results of Table 3, it can be seen that most adolescents had poor maternal and infant health compared to adults. The risk of adolescent pregnancy to have worse maternal health was twofold compared to adults, while the risk of adolescent pregnancy to have a worse infant health was 1.4 times compared to adults.

The next analysis was multivariable logistic regression on the relation between adolescent pregnancy and maternal and infant health. Based on the final results of logistic regression of the relation between adolescent pregnancy and maternal health in Table 4, it can be seen that

Table 2. Polychoric PCA Analysis

Component	Category	Polychoric PCA	
		Eigenvalue (λ)	CE
Maternal	Maternal morbidity status indicator	1.209	0.605
	Health service access indicator	1.399	0.466
	Health behavior indicator	2.939	0.368
	Maternal health index <sup>a</sup>	3.307	0.320
Infant	Infant morbidity status indicator	1.057	0.528
	Infant nutritional status indicator	1.307	0.435
	Infant health index	1.654	0.318

Notes:  
CE = Cumulative Explained; <sup>a</sup>polychoric PCA analysis after childbirth without complication variables and vitamin A

adolescent pregnancy with high education status had the greatest risk that was 5.4 times (95% CI = 1.3 - 22.0) to have poor health compared to adult pregnancy after being controlled by socioeconomic, occupation and region variables. While on the analysis of the relation between adolescent pregnancy and infant health, adolescent pregnancy had more health risks than adult pregnancy.

### Discussion

Based on the result of maternal health index, each individual did categorization into two, namely health index which has positive and negative value. Positive health index indicates good maternal health condition, while negative health index indicate poor maternal health conditions.<sup>15</sup> After the categorization of maternal health index was obtained, 942 respondents entered to the category of poor maternal health and 1,225 fell into the good health category. Then in the infant health index, 707 infants were categorized into poor health and 1,460 into good health category.

The relation between adolescent pregnancy and maternal health had interaction with education. In the high and middle education categories, adolescent pregnancy had worse health risk than adult pregnancy, almost the same with basic level of education. This is in line with study in the United States of America, stating that the higher level of education is positively correlated with the increasing adolescent pregnancy.<sup>17</sup> This happens because the level of a person's formal education does not necessarily reflect the level of education about sex and reproductive health.<sup>18</sup> In addition, although adolescents are highly educated, the mindset for healthy behavior still tends to be lower than that of adulthood.

Table 3. Bivariate Analysis

Variabel	Category	Poor		Good		Total	p Value	OR	95 % CI
		n	%	n	%				
		Maternal health	Adolescent	254	58.5%				
	Adult	688	39.7%	1.045	60.3%	1.733		<i>reff</i>	
Infant health	Adolescent	171	39.4%	263	60.6%	434	0.017	1.4	1.1 – 1.9
	Adult	536	30.9%	1.197	69.1%	1733		<i>reff</i>	

Notes:  
n= Number of sample; CI= Control interval

Table 4. Multivariate Analysis

Variable	Category	AOR	p Value	95% CI
Maternal Health <sup>a</sup>	Stratification by Education			
	Adolescent by No /Based Education	0.9	0.738	0.5 – 1.7
	Adolescent by Middle Education	1.9	0.001	1.3 – 2.8
	Adolescent by High Education	5.4	0.019	1.3– 22.0
Infant Health <sup>b</sup>	Adolescent	1.3	0.115	0.9 – 1.7

Notes:  
<sup>a</sup> confounding = occupation, social economy status, region; <sup>b</sup> confounding = social economy status; AOR=Adjusted odds ratio

Poor health conditions could be seen from complications of postpartum haemorrhage (OR = 1.36, preeclampsia (OR = 1.46), as well as low platelet syndrome (OR = 1.44).<sup>19</sup> Besides, poor health condition could also be seen from complications during pregnancy, one of them was anemia (OR = 1.8).<sup>10</sup> The worse health risk in adolescent pregnancies was that adolescents aged 11-15 years had risk 1.8 times, adolescents aged 16-19 years had risk 1.48 times greater than the age 20-34 years old. This is in line with meta-analysis studies with the evidence that young maternal age increases risk for maternal anaemia is also fairly strong, although information on other nutritional outcomes and maternal morbidity/mortality is less clear.<sup>20</sup> The state of maternal health can also be seen from the components of the index compiler, in which case there are 12 components or variables that make up.

Proportion of maternal and child health book ownership, the proportion of mothers receiving vitamins A during the puerperium, and the proportion of given information about pregnancy hazard during pregnancy in adolescent mothers were relatively lower than that of adult mothers. In fact, these three components are very important. Maternal and child health book provides information nutrition, growth and development, health services and to monitor the health of mothers and infants.<sup>21</sup> If viewed from the proportion of women receive vitamin A in the puerperium, it is in line with study which states that the status of vitamin A has a positive correlation with increasing maternal age. The older age of the mother, the greater the opportunities to consume vitamin A.<sup>22</sup> Provision of vitamin A in the puerperium is very important because the provision of vitamin A can help increase the content of vitamin A in breast milk.<sup>23</sup> In addition, vitamin A is also beneficial for improving maternal health after childbirth and preventing infection.<sup>24</sup>

While in the variable of provided information about pregnancy hazard during pregnancy, there were still many adolescent mothers who did not receive information during pregnancy (45%). Though pregnancy in adolescents still need many information related to mother and infant health. Most of adolescent pregnancies were the first pregnancies, so there was no underlying experience. This is in line with a study conducted in Indonesia, that knowledge of pregnancy signals worse at adolescent age than at adult age.<sup>25</sup> Knowledge of the alarm is required to perform early detection if a warning sign is found during pregnancy.

If viewed from the behavior of maternal health, the percentage of adolescent mothers who did not do tetanus immunization was higher than adult mothers. There was still about 13% who had not done tetanus immunization. While in the consumption of iron variables during pregnancy, there was only 27% of adolescent mothers

consuming iron during pregnancy. While tetanus immunization and iron consumption are very important. Based on study conducted in India, anemia occurs due to low iron intake during pregnancy in adolescent mothers.<sup>26</sup> Iron deficiency in the first and second trimesters increases the risk of doubling for premature and triple births for LBW. In adolescent pregnancy, iron requirement increases with increasing lean body mass and menstrual start. The need of iron increased more during pregnancy due to the expansion of maternal plasma volume as well as fetal and placental growth.<sup>27</sup>

Antenatal care behavior, adolescent mothers have worse behavior than adult mothers. This can be seen from the frequency of antenatal care in less than four times during pregnancy, checking the antenatal care in non-health service and with non-health workers, performing labor with non-health workers and non-health services and performing childbirth checking in non-health worker. This is in line with studies suggesting that the prevalence of pregnant women < 20 or > 35 was 1.2 times higher than to visit antenatal care compared to mothers aged 20-35 years. The range of the too young or too old age cannot perform the role of parenting and care with good antenatal care.<sup>28</sup> The older the mother, the greater the probability of the use of healthcare professional birth attendants.<sup>29</sup> In addition, this study is also consistent with studies conducted in Bangladesh stating that the maternal age affects service utilization.<sup>30</sup> Based on the results of a survey in Cambodia, Egypt, Madagascar and Nigeria stated that mothers aged younger than 20 years tend not to do postpartum examination with health worker.<sup>31</sup> If viewed as a whole, adolescents have worse health behaviors than other pregnant women. Poor health behaviors may be well informed about reproductive health.

Analysis in Table 4 shows that adolescent pregnancy had 1.3 times worse infants health risks than adult pregnancy. This is in line with study stating that mothers aged 16-17 years have infants worse health risks compared to mothers aged 20 years and older. While in mothers aged 18-19 years will have the same risks as mothers aged 20 years and older.<sup>32</sup> However, this is not in line with studies suggesting that the risk of pregnancy in adolescents is associated with low socioeconomic status, inadequate antenatal care and less weight at the time of pregnancy.<sup>33</sup> In addition, to assess the health of the infant can also be seen partially.

The opportunity of adolescent pregnancy to immediate breastfeeding in adolescent mothers 1.2 times (95% CI = 0.95 - 1.70) greater than adult mothers. This is not in line with a study by Kingston,<sup>9</sup> that adolescents aged 15-19 year-olds tend not to give immediate breastfeeding that was 2.5 times (95% CI = 1.8 - 3.7) higher than in adult mother older than aged 25 years old. This may be

due to the effect of confounding variables on both studies.

The proportion of adolescent mothers who did not take immunization for their infants was higher than adult mothers. This is in line with study conducted in India that only 41% of adolescent mothers provide complete immunization to their infants.<sup>34</sup> In addition to immunization, the proportion of infants of adolescent mothers who received vitamin A was also lower than adult mothers. It was almost the same as addition of iron for the infant. Infants from adolescent mothers were less likely to be given iron than infants from adult mothers. This is in line with the study of postpartum depression that tends to occur in adolescent mothers. Postpartum depression impacts a mother's ability to care for her infant and has been associated with adverse effects on child development.<sup>35</sup>

Adolescent mothers had a greater proportion of infants with LBW compared to adult mothers. This is in line with studies conducted in Indonesia which states that the risk of LBW in adolescents mother are higher than adult mothers.<sup>11,12</sup> In addition, a study conducted in Colombia also explained that adolescent pregnancies at the age of 11-15 years old have a risk to deliver LBW 1.3 times compared to pregnancy of women aged 20-24 years old. While in adolescents aged 16-17 years and 18-19 years had risk of 1.17 and 1.08 times respectively to deliver LBW.<sup>33</sup>

Two cases are possible to increasing the risk of adverse birth outcomes, the first is the effect of adolescent who are still in growth. At that time, the mother and fetus must compete for nutrition.<sup>33</sup> The second is a low gynecological age (fertilization that occurs within two years after menstruation), so that uterine immaturity in adolescents can increase subclinical infections, increased prostaglandin production and an increased risk of preterm birth.<sup>36</sup> Poor health in infants can also be seen from the morbidity shown by intensive care performed at infancy. The risk of infants with LBW, prematurely in adolescent mothers is higher for NICU admission, as consistently performed in several studies.<sup>33,36,37</sup>

The increasing poor health risks in adolescent pregnancies are as much as possible when treated with high quality and complete coverage of pregnancy and childbirth.<sup>38</sup> Maternal and infant health of adolescent mothers tend to have a higher risk than adult mothers. Based on the results obtained, a poor health risk was higher in the mothers than in the infants.

## Conclusion

Maternal health can be determined through maternal health index scoring which consists of three indicators that are maternal morbidity status, access to health services, and health behavior. While infant health can be de-

termined by making the infant health index score which consists of two indicators, namely infant morbidity status and infant nutritional status.

Adolescent pregnancies with high education level have the greatest risk to have poor maternal health compared to adult pregnancy after controlled by occupation, socioeconomic status, and regional variables. While in adolescent pregnancy with secondary education risk of adolescent have poor health higher than adult mothers. Adolescent pregnancy has their infant health worse compared to infants from adult mother.

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