# Biopsychosocial Factors Associated with Mental Retardation in Children Aged 6-17 Years in Tulungagung District, East Java

**Yani Ikawati[1,2), Yulia Lanti Retno Dewi [3), Rita Benya Adriani[4)**

[1) Midwifery Academy PGRI Kediri, East Java
[2)Masters Program in Public Health, Universitas Sebelas Maret
[3)Department of Nutrition, Faculty of Medicine, Universitas Sebelas Maret
[4) School of Health Polytechnics Surakarta

## ABSTRACT

**Background:** According to WHO, 15% of the world population, or 785 million people, suffer mental or physical disorders. Mental retardation is a serious problem socially and medically. Mental retardation affects child development in various forms: physical, self-care, communication, social, emotional, and mental. The objective of this study was to determine biopsychosocial factors associated with mental retardation in children aged 6-17 years.

**Subjects and Method**: This was a observational analytic study with case control design. It was conducted at Kauman and Tulungangung community health centers in Tulungangung District, East Java, from April to May, 2017. A sample of 100 parents of children aged 6 to 17 years old were selected for this study by fixed disease sampling, consisting of 25 parents of children with mental retardation and 75 parents of children without mental retardation. Children with mental retardation were identified and sampled at a disability special school in Tulungagung, East Java. The dependent variable was mental retardation. The independent variables were prenatal history, perinatal history, maternal stress during pregnancy, maternal education, and family income. The data were collected by a pre-tested questionnaire. Maternal stress was measured by Holmes and Rahe stress scale. The data were analyzed by path analysis.

**Results**: Mental retardation was directly associated with prenatal history (b= 1.17; 95% CI= 0.65 to 2.27; p= 0.038), perinatal history (b= 1.41; 95% CI= 0.87 to 2.73; p= 0.037), and maternal stress during pregnancy (b= 1.84; 95% CI = 0.59 to 3.09; p= 0.004). Prenatal history was associated with maternal education (b= -1.16; 95% CI= -2.17 to -0.15; p= 0.025) and maternal stress during pregnancy (b= 1.48; 95% CI= 0.43 to 2.54; p= 0.006). maternal stress during pregnancy was associated with maternal education (b= -1.65; 95% CI= 2.62 to -0.69; p=0.001) and family income (b=-1.35; 95% CI= 2.29 to -0.41; p=0.005). Family income was associated with maternal education (b= 1.70; 95% CI= 0.82 to 2.57; p<0.001).

**Conclusion:** Mental retardation is directly associated with prenatal history, perinatal history, and maternal stress during pregnancy.

**Keywords**: mental retardation, biopsychosocial factors, children

**Correspondence:**
Yani Ikawati. Masters Program in Public Health, Sebelas Maret University, Jl. Ir. Sutami 36 A, Surakarta, Central Java. Email: yaniikawati@gmail.com. Mobile: +6285655730050.

## BACKGROUND

Mental Retardation (RM) is a major public health problem in the society. People with mental retardation are a small part of the population. Mental retardation is a serious problem both in terms of social and in the field of medicine because it can affect children's development in various forms, namely physical aspects, self-care, communication, socializing and mental emotional impact that will affect their health but mental retardation can be overcome if detected earlier (Handayani, 2015).

Mental retardation is a common disorder, which is characterized by significant

cognitive dysfunction and lack of adaptability which occurs more in the age before 18 years with an Intelligence Quotient (IQ) score below 70 (Santrock, 2010).

According to the World Health Organization (WHO), 15% of the world's population or 785 million people experience mental and physical disorders. Data from the American Psychiatric Accreditation (APA), about 1-3% of the American population are mentally retarded in the neighborhood. Studies conducted in Pakistan and India show that the incidence of severe mental retardation ranges from 12-24/ 1,000, while in Bangladesh, it is around 5.9/ 1,000 childbirths. Other studies in the Netherlands reported that based on the population meta-analysis revealed a prevalence of RM 1% with a division of 85% of all cases being mild RM, Moderate RM 10% and RM weight/ very heavy 5% (Iqbal, 2014). In Asia, there are about 3% of the population (33.3 million people) who are mentally retarded. In Indonesia, based on data from the Ministry of National Education (DEPDIKNAS) in 2009, there were 4,253 children of mental retardation found in all extraordinary schools (Norhidayah et al., 2013).

According to Ahmad (2014), children with mental disabilities (children with mental retardation) in East Java Province who were accommodated in SLB - C in 2013/-2014 totaled 6,633 people or 61.21% of all children with special needs in East Java, totaling 10,836 children with intellectual disabilities. It consists of mild mental illness of 3,994 people (36.86%), mental retardation- moderate 2,639 people (24.35%) and mental retardation- severe 4,203 people (38.79%).

The causes of mental retardation include problems during pregnancy (malnutrition, alcohol, infectious disease), problems in childbirth (difficulty in childbirth, disturbing umbilical cord twisting), problems in

the first year of life (brain infection, prolonged yellow, seizures uncontrolled, accidents, malnutrition), problems in parenting (lack of stimulation, child abuse, neglect) and genetic factors. The number of people with mental retardation is currently estimated to have reached 2-3% of the total population. When viewed from the total population of Indonesia, people with mental retardation are around 962,011 people.

Psychological factors can affect the incidence of mental retardation in children. A mother with a very high level of stress during pregnancy is the most common cause of mental retardation, Down's syndrome or other syndromes, depending on the mechanism that causes the risk of birth of a child with mental retardation in a family (Norhidayah, 2013).

In Tulungagung, from 9 Special Schools (SLB) both public and private, SLB C Negeri Tulungagung is an SLB which has the biggest students from the category of mentally disabled in which this school has 95 mentally disabled students (Center for Education Data and Statistics-Culture Ministry of Education and Culture, 2016).

The purpose of this study is to analyze the effect of psychosocial factors on mental retardation in children aged 6-17 years in Tulungagung, East Java.

## SUBJECTS AND METHOD

### 1. Study Design
This was a case control study conducted in Kauman and Tulungagung Health Centers, Tulungagung, East Java, from April to May 2017.

### 2. Population and Sampling
The population in this study were all parents who had children aged 6-17 years who both experienced mental retardation and did not experience mental retardation in Kauman and Tulungagung Health Centers, Tulungagung, East Java.

A sample of 100 children consisting of two study subjects namely case study subjects and control study subjects.

a. Case study subjects were parents of children aged 6-17 years who experienced mental retardation based on student data in SLB in the Tulungagung Regency, East Java Province by fulfilling the inclusion criteria, namely:

1) Parents of children aged 6-17 years who experienced mental retardation in SLB in the Tulungagung Regency Area registered in the student data at school.

2) Having complete medical records, for example KIA books that can show maternal and child health history in the past (prenatal, perinatal).

3) Willing to be the subject of study.

b. The subjects of the control study were parents of children aged 6-17 years who did not experience mental retardation based on students' data in SLB in Tulungagung Regency, East Java Province by fulfilling the inclusion criteria, namely:

1) Parents of children aged 6-17 years who did not experience mental retardation in Tulungagung Regency.

2) Having complete medical records, for example KIA books that can show maternal and child health history in the past (prenatal and perinatal).

The sampling technique used is fixed disease sampling that is selecting samples based on disease status, ie those which are diseased or not diseased, while subject exposure status varies according to the disease status of the subject (Murti, 2013).

### 3. Study Variable

There are six variables in this study consisting of dependent and independent variables. The dependent variable is the incidence of mental retardation in children aged 6-17 years. The independent variables are prenatal history, perinatal history, stresses on the mother during pregnancy, mother's education level and family income.

### 4. Operational Definition

Operational definitions of prenatal history are processes during pregnancy that affect the incidence of mental retardation in children aged 6-17 years, such as the elderly age of mothers, mothers who consume alcohol, pregnant women who smoke, DM in pregnant women, maternal hypertension, maternal epilepsy and maternal asthma.

Perinatal history is the process of childbirth that affects the incidence of mental retardation in children aged 6-17 years (prolonged labor, labor with forceps / vacuum extraction, shoulder dystocia, site abnormalities).

Stresses in the mother during pregnancy is a state of feeling disturbed or inner in the life of a pregnant woman, causing disruption during pregnancy which can affect the incidence of mental retardation in children aged 6-17 years.

The mother's education level is the last level of formal education that has been taken by mothers of children aged 6-17 years based on the latest diploma they have (both parents of children aged 6-17 years who experience mental retardation or not).

Family income is an income that is used as the source of the family's economy for 1 month according to the district MSE standard. Tulungagung in which the UMK value is in accordance with the time (year) of pregnancy.

Mental retardation is a condition with less intelligence or intelligence accompanied by reduced ability to adjust to children aged 6-17 years.

### 5. Study Instruments

The data were collected by filling out questionnaires. The questionnaire consists of favorable statements (statements that contain things that are positive and do not support the occurrence of mental retardation in children aged 6-17 years) and unfavorable statements (statements that contain things that

are negative and support for the occurrence of retardation mentally in children aged 6 to 17 years). The questionnaire used and is already based on the standard is Holmes and Rahe stress scale.

## 6. Data Analysis

The data were analyzed by path analysis. Path analysis is an analysis technique that is used to determine the effect of an exogenous variable on endogenous variables that affect directly or indirectly. The magnitude of the effect of the independent variable (exogenous) on the dependent variable (endogenous) that can be seen from the path coefficient value, the greater the path coefficient, the greater the effect given by the variable. The steps of data analysis were done using path analysis, including model specifications, model identification, model suitability, parameter estimation, and model specifications.

## RESULTS

### A. Univariate Analysis

Table 1 shows that maternal age during pregnancy is mostly 20-35 years old, for about 91 study subjects (91.0%). Most of them did not work for about 88 study subjects (88.0%). Most of the subjects of this study gave birth to their children <3 times amounting to 96 study subjects (96.0%).

The frequency distribution of univariate variables explaining the general description of each variable studied included prenatal history, perinatal history, stress on the mother during pregnancy, maternal education level and family income.

Mother without prenatal history were about 69 study subjects (69.0%) while the mother with no perinatal history problem were 85 study subjects (85.0%), most mothers, during pregnancy, experienced low stress for about 53 study subjects (53.0%). Mother's education level is mostly in the category of higher education (≥senior high school) which is 60 people (60.0%). The family income of most of Tulungagung Regency KUMK is 54 people (54%).

**Table 1. Characteristic of the study subjects**

| Characteristics | Criteria | Frequency | (%) |
|---|---|---|---|
| Maternal age at pregnancy | < 20 years | 0 | 0.0 |
| | 20 - 35 years | 91 | 91.0 |
| | ≥ 35 years | 9 | 9.0 |
| Maternal Age | Housewife | 88 | 88.0 |
| | Student / College Student | 0 | 0.0 |
| | Civil Servant / Military / Police | 0 | 0.0 |
| | Entrepreneur | 6 | 6.0 |
| | Private | 6 | 6.0 |
| Parity | Giving birth < 3x | 96 | 96.0 |
| | Giving birth ≥ 3x | 4 | 4.0 |
| Prenatal history | No problem | 69 | 69.0 |
| | Found problem | 31 | 31.0 |
| Perinatal history | No problem | 85 | 85.0 |
| | Found problem | 15 | 15.0 |
| Stress during pregnancy | Low | 53 | 53.0 |
| | High | 47 | 47.0 |
| Maternal education | < SHS | 40 | 40.0 |
| | ≥ SHS | 60 | 60.0 |
| Family income | < Minimum wage | 46 | 46.0 |

| ≥ Minimum wage | 54 | 54.0 |
|---|---|---|

## B. Bivariate Analysis

Table 2 showed that prenatal history, perinatal history, stress in the mother during pregnancy, maternal education level, family income affect the incidence of mental retardation in children aged 6-17 years.

**Table 2. Bivariate Analysis of the Effect of Independent Variables on the Incidence of Mental Retardation in Children Aged 6-17 Years Old**

| Variable | Non Mental Retardation | | Mental Retardation | | Total | | OR | CI 95% | p |
|---|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | | | |
| **Prenatal History** | | | | | | | | 2.09 to 14.63 | <0.001 |
| No Problem | 59 | 85.5 | 10 | 14.5 | 69 | 100 | 5.53 | | |
| A Problem | 16 | 51.6 | 15 | 48.4 | 31 | 100 | | | |
| **Perinatal History** | | | | | | | | 1.45 to 14.39 | 0.006 |
| No Problem | 68 | 80.0 | 17 | 20.0 | 85 | 100 | 4.57 | | |
| A Problem | 7 | 46.7 | 8 | 53.3 | 15 | 100 | | | |
| **Maternal Stress During Pregnancy** | | | | | | | | 3.07 to 31.87 | <0.001 |
| Low | 49 | 92.5 | 4 | 7.5 | 53 | 100 | 9.89 | | |
| High | 26 | 55.3 | 21 | 44.7 | 47 | 100 | | | |
| **Maternal Education** | | | | | | | | 0.17 to 1.05 | 0.059 |
| Low (<HS) | 26 | 65.0 | 14 | 35.0 | 40 | 100 | 0.42 | | |
| High (≥HS) | 49 | 81.7 | 11 | 18.3 | 60 | 100 | | | |
| **Family Income** | | | | | | | | 0.15 to 0.96 | 0.037 |
| Poor | 30 | 65.2 | 16 | 34.8 | 46 | 100 | 0.38 | | |
| Adequate | 45 | 83.3 | 9 | 16.7 | 54 | 100 | | | |

Approximately 48.4% of mothers who have children aged 6-17 years who experience mental retardation show a problem in their prenatal history while 85.5% of mothers who have children aged 6-17 years who are not mentally retarded have no problems with their prenatal history.

The results of the analysis with Chi Square test showed that mothers who experience problems in prenatal history had a possibility of 5.53 times causing mental retardation children in children aged 6-17 years (OR= 5.53; 95% CI= 2.09 to 14.63; p<0.001).

About 53.3% of mothers who have children aged 6-17 years who experience mental retardation show a problem in their perinatal history while 80.0% of mothers have children aged 6-17 years who do not experience mental retardation show no problem in their prenatal history.

The results of the analysis with Chi Square test showed that mothers who experienced problems with perinatal history had a probability of 4.57 times causing children with mental retardation in children aged 6-17 years (OR= 4.57; 95% CI= 1.45 to 14.37; p= 0.006).

Approximately 44.7% of mothers who have children aged 6-17 years who experience mental retardation show high stress during pregnancy while 92.5% of mothers who have children aged 6-17 years who are not mentally retarded do not experience high stress during pregnancy.

The results of the analysis with Chi Square test showed that mothers who experienced high stress during pregnancy

had a possibility of 3.25 times causing mental retardation children at the age of 6-17 years (OR= 3.25; 95% CI = 1.17 to 9.05; p = 0.020).

About 35.0% of low-educated mothers (<High School) have 6-17 years old children who experienced mental retardation while 81.7% of highly-educated mothers (≥High School) have 6-17 years old children who did not experience mental retardation.

The results of the analysis with Chi Square test showed that mothers with high level of education (≥High School) have the likelihood to caused their children to have mental retardation at the age of 6-17 years old by 0.42 time (OR= 0.42; 95% CI=0.17 to 1.05; p= 0.059).

About 34.08% of mothers with lack of family income(<MW) have 6-17 years old children who experienced mental retardation while 83.3% of mothers with high family income (≥MW) have 6-17 years old children who did not experience mental retardation.

The results of the analysis with Chi Square test showed that mothers with high family income (≥MW) have the likelihood to caused their children to have mental

retardation at the age of 6-17 years old by 0.38 time (OR= 0.38; 95% CI= 0.15 to 0.96; p= 0.037).

**C. Multivariate Analysis**
Table 3 showed that mental retardation was affected by prenatal history, perinatal history, and maternal stress during pregnancy.

Mothers who have problems with their prenatal history were 1.17 times more likely to increase the occurrence of mental retardation in children aged 6-17 years old (b= 1.17; 95% CI= 0.65 to 2.27; p= 0.038). A problem in prenatal history was affected by maternal education and maternal stress during pregnancy.

Highly-educated mothers have greater logodd to reduce the problems in their prenatal history by 1.16 times (b=-1.16; 95% CI= -2.17 to -0.15; p= 0.025). High maternal stress during pregnancy have greater logodd to increase the occurrence of problems in their prenatal history by 1.48 times (b=1.48; 95% CI= 0.43 to 2.54; p= 0.006).
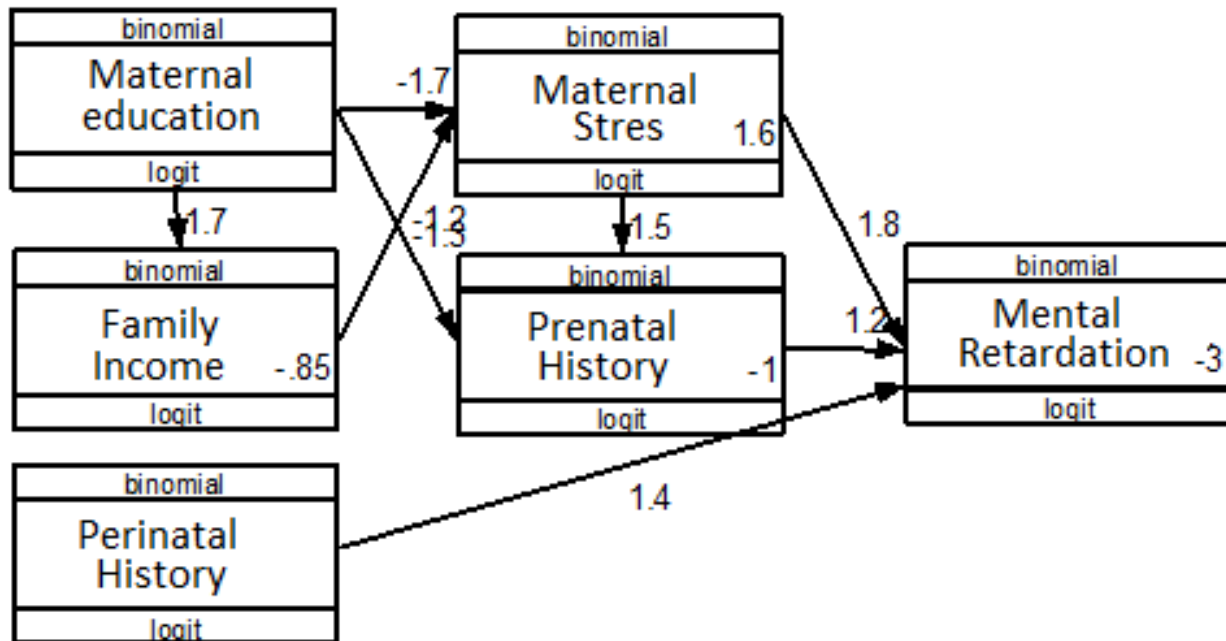
**Figure 1. Structural Model with Path Coefficient Estimation**

**Table 3. Path Analysis Results of the Effect of Independent Variables on the Incidence of Mental Retardation Among 6-17 Years Old Children**

| Dependent Variable | | Independent Variable | b | 95% CI | | P |
|---|---|---|---|---|---|---|
| | | | | Lower Limit | Upper Limit | |
| **Direct Effect** | | | | | | |
| Mental Retardation | ← | Prenatal History | 1.17 | 0.65 | 2.27 | 0.038 |
| | ← | Perinatal History | 1.41 | 0.87 | 2.73 | 0.037 |
| | ← | Maternal Stress During Pregnancy | 1.84 | 0.59 | 3.09 | 0.004 |
| **Indirect Effect** | | | | | | |
| Maternal Stress During Pregnancy | ← | Maternal Education | -1.65 | -2.62 | -0.69 | 0.001 |
| | ← | Family Income | -1.35 | -2.29 | -0.41 | 0.005 |
| Family Income | ← | Maternal Education | 1.70 | 0.82 | 2.57 | <0.001 |
| Prenatal History | ← | Maternal Education | -1.16 | -2.17 | -0.15 | 0.025 |
| | ← | Maternal Stress During Pregnancy | 1.48 | 0.43 | 2.54 | 0.006 |
| Log Likelihood = -208.25 | | | | | | |

A problem in perinatal history has greater logodd to increase the incidence of mental retardation among 6-17 years old children by 1.41 times (b= 1.41; 95% CI= 0.87 to 2.73; p= 0.037).

High maternal stress during pregnancy have 1.84 times greater logodd to increase the occurrence of mental retardation among 6-17 years old children (b=1.84; 95% CI= 0.59 to 3.09; p= 0.004). High maternal stress during pregnancy was affected by maternal education and family income. High level of education has 1.65 times greater logodd to decrease the occurrence of high maternal stress during pregnancy (b=-1.65; 95% CI= -2.62 to -0.69; p= 0.001). Adequate family incomes have 1.35 times greater logodd to reduce the occurrence of

high maternal stress during pregnancy (b=-1.35; 95% CI= -2.29 to -0.41; p= 0.005).

Adequate family income was affected by maternal educational level. Highly-educated mothers have greater logodd to increase the family income by 1.70 times (b= 1.70; 95% CI= 0.82 to 2.57; p<0.001).

## DISCUSSIONS

### 1. The Effect of Prenatal History on Mental Retardation

The results of this study showed that there was an effect of prenatal history on the incidence of mental retardation in 6-17 years old children in the area of Tulungagung District, East Java.

This study was supported by a a study done by Katiyar and Gupta (2014), which showed that there was an effect of prenatal history on the incidence of mental retardation among children in Varanasi. Maternal age at pregnancy, excessive use of nicotine and alcohol during pregnancy were the major causes of mental retardation. A problem in prenatal can lead to prematurity and LBW, and these factors can be one of the causes of mental retardation. Based on the study above, it was expected that a well-planned pregnancy planning, regular pregnancy check-ups, fulfillment of good nutrition and environment, and avoidance of accidents or trauma during pregnancy were needed. Early identification and screening on pregnant women was also very necessary in this problem (Katiyar and Gupta, 2014).

A study by Huang *et al.,* (2016) also mentioned that from the 16 potential risk factors analyzed, ten prenatal factors (old maternal age, maternal skin race, low maternal education, third or greater parity, pregnant women who consumed alcohol, pregnant women who smoke, diabetes mellitus in mothers, hypertension in mothers, epilepsy, and asthma) affected the incidence of mental retardation.

According to Salmiah (2010), the causes of mental retardation were infection and drug abuse during pregnancy. The infection that usually occurred was rubella, which can lead to brain damage. Maternal disease could also lead to mental retardation, such as syphilis, cytomegalovirus, and genital herpes. Medications used by the mothers during pregnancy could affect the baby's health through the placenta. Some of them can cause physical disability and severe mental retardation. Children with mothers who drink alcohols during pregnancy could cause the baby to have fetal syndrome and it was the most obvious cases of mental retardation cause. Labor complications, such as lack of oxygen or head injury, brain infections (encephalitis and meningitis), and exposed to toxins (lead-containing paint) have the potential to cause mental retardation.

Based on the descriptions above, the writers concluded that a problem in prenatal history could increase the incidence of mental retardation among 6-17 years old children. This was because the prenatal period was a critical period so that the effect of maternal body conditions would support the development of innate nature. Good and bad characters would later influence the pattern of future development.

### 2. The Effect of Perinatal History on Mental Retardation

The results of this study showed that there was an effect of perinatal history in increasing the incidence of mental retardation among 6-17 years old children in the area of Tulungagung District, East Java.

The result of this study was supported by a study done by Nurochim *et al* (2016) which showed that children who were born safely during the labor process and able to adapt to the environment outside the womb could reduce the risk of MR in children by 0.45 time than children who experienced

complications in perinatal stage (OR=0.45; 95% CI= 0.15 to 1.40; p= 0.168). According to Maramis (2005), at the time of the birth process (perinatal) the baby's head could experience pressure, so that it could lead to the bleeding in the brain and it was also due to the lack of oxygen which then caused the degeneration of brain cortex cells which would lead to mental retardation.

Based on the descriptions above, the writers concluded that a problem in perinatal history could increase the incidence of mental retardation among 6-17 years old children. This was because the perinatal period was a time of the labor process when the fetus, placenta, and membrane was out of the uterus through the birth canal with the help or by its own strength so that the maternal role during the labor was very necessary, because the effect of maternal body conditions would support the progress and success in labor.

3. **The Effect of Maternal Stress During Pregnancy on Mental Retardation**

The results of this study showed that there was an effect of maternal stress during pregnancy in increasing the incidence of mental retardation among 6-17 years old children in the area of Tulungagung District, East Java.

Maternal stress during pregnancy was affected by maternal educational level, a high level of education could reduce maternal stress during pregnancy. Maternal stress during pregnancy was also affected by family income. An adequate family income would reduce maternal stress during pregnancy.

The result of this study was supported by a study done by Norhidayah (2013) which showed that a mother who suffered extremely high stress during pregnancy was the most common cause of mental retardation which depend on the mechanism of the cause of babies who were born with mental retardation. Psychosocial stress was common and at a high level which related to mothers who gave bad contribution to pregnancy products in the form of congenital defects and psychiatric disorders (Supariasa *et al.*, 2016). Good stress management would help in reducing the impacts of stress. Stress which was ignored would changed the body's natural stress management system. When pregnant women feel anxious, their body would produce stress hormones that could affect the fetus, namely epinephrine and norepinephrine which have an effect on raising blood pressure and reducing oxygen supply to the uterus. Some of the stress dangers which were not managed properly for maternal and fetal health include neurodevelopment could lead to abnormalities in the formation process of the fetal brain. Therefore, it could trigger behavioral problems in the growth of the babies in the future (Servili *et al.*, 2010).

This study was supported by a study of Maramis (2009) which showed that mothers with low level of education would be susceptible to stress and anxiety during pregnancy compared to pregnant women who have high level of education, because by having a high level of education. Highly-educated mothers would have a broader knowledge and would be easier to understand the problems that they faced, and also able to prepared the strategies in solving the problems.

This study was supported by a study of Ali, (2014) which stated that pregnant women who have low economic level were unable to provide adequate nutrition so that they experienced low nutritional status with a heavy workload (stress). In the stress conditions, which was in the emergence of external stress factors, would trigger the release of stress hormones which eventually would increase the body's micronutrient

needs, and at the same time, it also affected the physical and psychological condition of the body. While micronutrient deficiencies which accompanied by stress oxidative would cause DNA damage. The small amount of family income or dependency on the family's social economy could lead to stress (inner pressure) and unpleasant conditions during pregnancy so that it would lead to mental retardation in children aged 6-17 years old (Ali, 2014).

A different result of the study was shown by Rini (2007) which stated that there was no effect between maternal psychosocial stress with the incidence of mental retardation. According to the data obtained from 41 patients with mental retardation, there were 10 mothers who suffered from psychosocial stress during pregnancy.

Based on the descriptions above, the writers concluded that the incidence of mental retardation among 6-17 years old children was affected by prenatal history, perinatal history, and maternal stress during pregnancy. Prenatal history was affected by maternal education and maternal stress during pregnancy. Maternal stress during pregnancy was affected by maternal education and family income. Family income was affected by maternal education.

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