



Association between Maternal Mental Health and Child Stunting in Indonesia

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Abstract

This study aims to study maternal mental health's association to stunting in children under five years old in Indonesia, which is related to mothers, children, and households' characteristics based on the age group of children under five years old. This study uses longitudinal data from the Indonesian Family Life Survey (IFLS) in 2007 and 2014 with the Logistic Regression method. Maternal mental health was measured using the CESD-10 instrument. The results showed that in the children's age group of 0-59 months and 24-59 months, an increase in the total CESD-10 score was associated with stunting in children after being controlled by all the characteristics. At age 0-23 months, the increase in the total score of CESD-10 was not associated with stunting. Maternal height, breastfeeding duration, child age, birth weight, and residence location were associated with stunting in all age groups. Maternal education and expenditure quintiles were associated with stunting in the 0-59 months and 24-59 months age groups. Meanwhile, two variables only relate to the incidence of stunting in one age group of children under five, namely maternal age (0-59 months of children under five) and sanitary conditions (24-59 months of children under five).

Introduction

Based on data from Riset Kesehatan Dasar (Riskesdas) in 2018, the prevalence of stunting in children under five in Indonesia is still high. If observed according to the nutritional status prevalence threshold according to WHO (2017), in addition to underweight who are at moderate prevalence, both stunting and wasting are still in the high and severe prevalence category (Fig.

1). Stunting is a serious health problem in child development characterized by height for age below -2 standard deviations. Stunting children will have poor quality health and cognitive abilities, resulting in low productivity and wages when adults (De Onis & Branca, 2016; Pacheco et al., 2017). Therefore, stunting can inhibit economic growth, increase inequality, and poverty in a region (Allen, 2014).

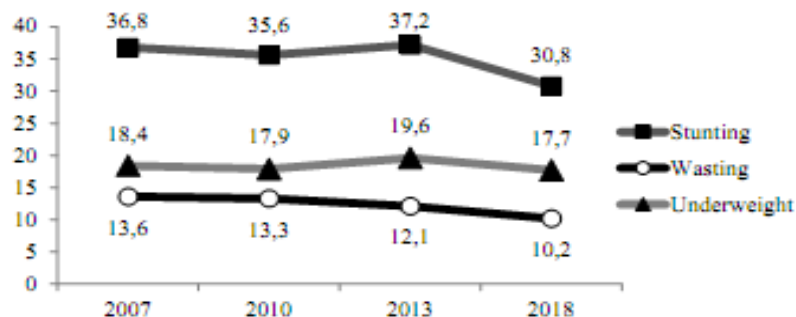


Figure 1. Prevalence of Stunting, Wasting and Underweight Children in Indonesia 2007-2018 (Kementerian Kesehatan RI)

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Several studies suggest that maternal mental health is associated with child nutrition, especially in the Asian region (Nguyen et al., 2014; Surkan et al., 2008; Upadhyay & Srivastava, 2016). Mental disorders are one of the health problems in many countries. It is estimated that 322 million people worldwide suffered from depression in 2015, and nearly half (48 percent) were in the Asia Pacific region. According to gender, most people with depression are women (Steel et al., 2014; WHO, 2017). Based on Riskesdas 2018, the prevalence of mental-emotional disorders in Indonesia among people aged 15 years and over was around 6 percent in 2013 and increased to 9.8 percent in 2018 (Kementerian Kesehatan RI, 2018). In terms of being the primary caregiver for children, mothers who experience maternal depression will be associated with their children's nutritional condition (Motlathledi et al., 2017). Children who experience low nutritional status, both underweight, stunting, and wasting, will increase the risk of morbidity and mortality (WHO, 2017).

The first thousand days of life (the golden period) or the period from when the fetus is still in the womb to after the birth of a human is essential. Pulungan et al., (2018) states that babies and early childhood are healthy and smart, starting from their mother's factors during pregnancy and the pre-pregnancy period to prepare for pregnancy correctly. Therefore, it is necessary to deal with health problems in early childhood.

Because, stunting impacts the individual level and at the community level. The benefit-cost ratio of each country varies but based on the research of Hoddinott et al. (2013), assuming that for every value of money invested in the stunting reduction program in Indonesia, estimated that 48 times the economic value return will be obtained.

Although research on the relationship between maternal mental health and stunting in children under five has been carried out in many countries, few studies link the two in Indonesia. Existing studies only focus on specific areas and population groups, not covering a wider area and population groups. Therefore, this study focuses on the relationship between maternal mental health and the incidence

of child stunting and reviews it according to catch-up age groups on under-five stunting in Indonesia. In this study, nutritional status was measured using anthropometric achievements of children under five according to the height according to age (height/age), then categorized according to WHO categorization. Mental health measurements were seen through an increase in the total score of CESD-10 between 2007 and 2014 using longitudinal data from the Indonesian Family Life Survey (IFLS). Therefore, this research aims to study maternal mental health's stunting relationship in children under five in Indonesia.

The linear growth since the beginning of life is the best indicator in determining welfare and an accurate marker in the boundaries of human development gaps (De Onis & Branca, 2016). Therefore nutrition at the beginning of life is essential for short-term and long-term investment (Martorell, 2017). Allen (2014) define health and nutrition through the household production function approach and its derivative forms. In their description, Behrman and Deolalikar revealed that a person's health and nutrition productivity starts from household-level consumption. In general, Indonesia's population is short (Pulungan et al., 2018; Sohn, 2015). However, short stature due to stunting is different from genetically short. Stunting in children is a chronic nutritional problem continuing (Scheffler et al., 2020; Tanjung et al., 2020). In addition to the direct impact experienced by children, stunting can be associated with the next generation's health, social, and economic conditions (De Onis & Branca, 2016).

Mental health can be affected by several socio-economic factors (Allen et al., 2014). Depression is one of the most common mental health problems. Approximately 30 to 50 percent of adults who experience depression tend to become chronic or recurring disorders in a cycle of ongoing stress. Management and family relationships become increasingly hard, and social costs increase (Allen, 2014). Depression is a mental disorder that is more common in women than in men (Douglas & Scott, 2014). Where the risk of depression increases in the perinatal period (Bauer et al., 2016).

In Upadhyay & Srivastava view (2016), a person's human capital (Human Capital) is related to the quality of increasing future income by increasing human resources by investing through education, health, and care since childhood. Therefore mental health and nutrition as part of the scope of health are aspects of human capital that are prerequisites for increasing productivity (Upadhyay & Srivastava, 2016). Weak mental health has been linked to impaired parent-child interaction, increasing the risk of mother-child relationships lacking enthusiasm and energy in raising children (Wemakor & Mensah, 2016).

Mothers who have mental health problems such as depression, apart from experiencing limitations themselves, impact their families, especially their children. From an economic perspective, maternal depression can be associated with decisions related to preferences, risks, business costs, and maternal aspirations to reduce human capital investment in children (Baranov et al., 2020). Besides, malnourished children are at risk of developing failure and are prone to infections and other health problems, resulting in reduced human capital. Children with limited human capital tend to be uncompetitive, resulting in decreased productivity and low wages (Victora et al., 2008).

Method

This study uses data from the 4th and 5th waves of the Indonesian Family Life Survey (IFLS). This study's analysis unit is a single child aged less than five years or 59 months who lives with a biological mother. In the next step, after removing a sample of children under five who did not have information about the variables needed in this study, 2,879 samples of under-fives were obtained, which could be analyzed. The dependent variable in this study is stunting status in children. In this study, the nutritional status used was the height index according to age (height/age), further categorized into two, namely standard/normal and stunting. This study's primary independent variable is the increase in the mother's CESD-10 score, used

to describe the mother's mental health. The increase in the CESD-10 score was observed through depression changes' scores in 2007 and 2014. The CESD is an independent measurement instrument designed by Wemakor & Mensah to measure depressive symptoms in a population. It is easy to use where respondents only answer a few question items in CESD without going through related health personnel (Wemakor & Mensah, 2016). In this study, the improvement in depressive symptoms was calculated by looking at the positive difference between the total CESD-10 score at two study time points.

In addition to the variable of maternal depression symptoms as the primary independent variable, this study also used other independent variables as control variables. This study's control variables were grouped according to mother, child, and household characteristics. Mother characteristics consisted of variables of mother's age, mother's education, mother's height, breastfeeding duration, exclusive breastfeeding, and birth spacing. The child's characteristics consisted of gender, birth weight, age of the child, and birth order. Household characteristics consist of household expenditure variables, sanitary conditions, and location of residence. In this study, the analysis was carried out by looking at the relationship between the independent variables and the child's stunting status using three approaches according to the age group of children under five. The first group is the child group aged 0-59 months, the second group is the child group aged 0-23 months, and the last group is the child group aged 24-59 months. This study uses the binary logistic regression method (Logit).

Result And Discussion

Table 1 shows that children under five who had a stunting condition in 2014 were 33.31. The proportion is almost the same in all age groups in more detail. In this study, all categories were dominated by the mother's condition, who experienced an increase in the CESD-10 score.

Table 1. The Distribution of the Samples Studied According to the Age Group Under Five

Variables	Total (n)	0-59 Months		0-23 Months		24-59 Months	
		Percentage (%)	Total (n)	Percentage (%)	Total (n)	Percentage (%)	Total (n)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Stunting Status	Normal	1,920	66.69	726	66.73	1,194	66.67
	Stunting	959	33.31	362	33.27	597	33.33
Improved CESD-10 Score	0	1,161	40.33	470	43.20	691	38.58
	1-9	1,424	49.46	524	48.16	900	50.25
	≥ 10	294	10.21	94	8.64	200	11.17
Mother's Age	20-25 Years	322	11.18	171	15.72	151	8.43
	25-30 Years	787	27.34	301	27.67	486	27.14
	30-35 Years	954	33.14	353	32.44	601	33.56
	35-40 Years	592	20.56	209	19.21	383	21.38
	40-45 Years	188	6.53	49	4.50	139	7.76
	45+ Years	36	1.25	5	0.46	31	1.73
Mother's Education	Elementary Sch. & Below	745	25.88	254	23.35	491	27.41
	Junior High Sch.	723	25.11	265	24.36	458	25.57
	Senior High Sch. & Above	1,411	49.01	569	52.30	842	47.01
Mother's Height	< 145 cm	288	10.00	110	10.11	178	9.94
	≥ 145 cm	2,591	90.00	978	89.89	1,613	90.06
Duration of Breastfeeding	< 6 Months	636	22.09	353	32.44	283	15.80
	6-12 Months	392	13.62	291	26.75	101	5.64
	12-18 Months	459	15.94	241	22.15	218	12.17
	18-24 Months	532	18.48	203	18.66	329	18.37
	≥ 24 Months	860	29.87	-	-	860	48.02
Exclusive Breastfeeding	No	2,298	79.82	882	81.07	1,416	79.06
	Yes	581	20.18	206	18.93	375	20.94
Birth Spacing	0 Months	1,622	56.34	486	44.67	1,136	63.43
	1-33 Months	435	15.11	168	15.44	267	14.91
	≥ 33 Months	822	28.55	434	39.89	388	21.66
Gender	Female	1,378	47.86	508	46.69	870	48.58
	Male	1,501	52.14	580	53.31	921	51.42
Birth Weight	< 2,5 Kg	213	7.40	70	6.43	143	7.98
	≥ 2,5 Kg	2,666	92.60	1,018	93.57	1,648	92.02
Children's Age	0-12 Months	523	18.17	523	48.07	-	-
	12-24 Months	565	19.62	565	51.93	-	-
	24-36 Months	95	3.30	-	-	95	5.30
	36-48 Months	1,054	36.61	-	-	1,054	58.85
	48-60 Months	642	22.30	-	-	642	35.85
Birth Order	1	1,605	55.75	481	44.21	1,124	62.76
	2	875	30.39	416	38.24	459	25.63
	3	266	9.24	130	11.95	136	7.59
	4+	133	4.62	61	5.61	72	4.02
	Expenditure Quintile	Q1	556	19.31	194	17.83	362
Q2		581	20.18	224	20.59	357	19.93
Q3		550	19.10	202	18.57	348	19.43
Q4		580	20.15	231	21.23	349	19.49
Q5		612	21.26	237	21.78	375	20.94
Sanitation	Proper	667	23.17	246	22.61	421	23.51
	Not Proper	2,212	76.83	842	77.39	1,370	76.49
Location	Urban	1,741	60.47	666	61.21	1,075	60.02
	Rural	1,138	39.53	422	38.79	716	39.98
Primary Caregiver	Mother	2,702	93.85	1,019	93.66	1,683	93.97
	Father	24	0.83	7	0.64	17	0.95
	Grandparents	142	4.93	58	5.33	84	4.69
	Others	11	0.38	4	0.37	7	0.39

Source: IFLS 4 and IFLS 5, compiled

Although there is a suspicion of endogeneity in this study, due to the complicated relationship, this study only uses association analysis, not causality analysis. Therefore, in analyzing the relationship between the independent variables and the dependent variable, binary logistic regression is used to determine which variables are associated with children's stunting status. The inferential analysis is presented in Table 2. The logit model of the 0-59 month group of children shows that the variables proven to provide a positive and significant association are an increase in CESD-10 score, duration of breastfeeding, and residence location. Meanwhile, the variables that have proven to be negatively and significantly associated were maternal age, maternal education, maternal height, child age, birth weight, and expenditure quintile. This research shows that the increased risk of stunting in children aged 0-59 months is influenced by an increase in the CESD-10 score in mothers, younger maternal age, education of mothers who do not / have graduated from primary school when compared to mothers who have completed at least senior high school, shorter maternal posture, longer breastfeeding duration, younger age of children, LBW, lowest expenditure quintile compared to the highest quintile, and those living in rural areas.

For child group aged 0-23 months, although it can increase the risk of stunting, statistically, the variable CESD-10 score increase as the primary independent variable is not proven to be significant. In the logit model, the variables that proved to be statistically significant in a negative direction were the mother's height and the child's birth weight. Meanwhile, the positive association was indicated by the duration of breastfeeding, the child's age, and residence location. This result means that increasing mothers, adequate birth weight of children, shorter breastfeeding duration, increasing age, and living in urban areas can reduce the chances of children under five experiencing stunting.

In the child group aged 24-59 months, the variables that proved to be statistically significant in a negative direction were maternal

education and height, age and birth weight of children, and expenditure quintile. Meanwhile, the positive association was indicated by an increase in the CESD-10 score, duration of breastfeeding, and household residence location. This result means that the lower the increase in the mother's CESD-10 score, the higher the mother's height, the mother with minimum high school education, the increasing age of the child, sufficient birth weight of the child, the fifth expenditure quintile, shorter breastfeeding duration, and living in urban areas can reduce the chances of children under five experiencing stunting status.

Mothers who have chronic depressive symptoms can be associated with their health and significantly reduce the quality of their child's health (Vliegen et al., 2013). Besides, other evidence from previous research conducted by Girma et al. (2019), in Ethiopia and Wemakor & Mensah (2016), in Ghana stated that children who have mothers with episodic depression symptoms are at 2-3 times higher risk of experiencing stunting. Duarte et al. (2012), noted that maternal depression is related to eating difficulties or unhealthy feeding practices. Where mothers who experience depression tend to let their children eat alone so that for younger children, food fulfillment is disturbed, while older children are likely to eat alone without supervision.

If broken down according to the age group of children under five, this study shows that the increase in the CESD-10 score of the mother is not associated with the stunting status of children aged 0-23 months. Although these results contradict the research of Avan et al. (2010), in South Africa, which showed a relationship, these results are in line with the study of Kaaya et al. (2016), in Tanzania and Wemakor & Iddrisu (2018), in Ghana who states that maternal depression is not related to stunting status in the 0-23 month age group. This result is related to the complex nature of maternal depression and the potential association with infant nutritional status, which may vary according to the severity of a woman's depression and the level of support she may receive from family and the wider community.

Table 2. Summary of Estimated Output Parameters (β) and Odds Ratio (Exp (β)) Binary Logistic Regression in the Stunting Model by Age Group

Variables	Age Groups (Months)					
	0-59		0-23		24-59	
	β	Exp(β)	β	Exp(β)	β	Exp(β)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Maternal Mental Health	0,0260 ***	1,0263	0,0189	1,0191	0,0335 ***	1,0341
Mother's Age	-0,0146 **	0,9855	-0,0155	0,9846	-0,0110	0,9890
Mother's Education						
Elementary School and Below						
Junior High School	-0,1068	0,8987	-0,2300	0,7945	-0,0593	0,9424
Senior High School and Above	-0,2818 ***	0,7544	-0,1352	0,8735	-0,4244 ***	0,6541
Mother's Height	-0,0773 ***	0,9257	-0,0576 ***	0,9440	-0,0942 ***	0,9101
Duration of Breastfeeding	0,0322 ***	1,0328	0,0358 **	1,0365	0,0207 ***	1,0209
Exclusive Breastfeeding						
No						
Yes	-0,0543	0,9471	-0,2833	0,7533	-0,0222	0,9780
Birth Interval						
1-33 Months						
0 Months	-0,2156	0,8060	0,8646	2,3740	-0,7328	0,4806
≥ 33 Months	-0,1376	0,8714	-0,0469	0,9542	-0,1909	0,8262
Children's Age	-0,0071 **	0,9929	0,0473 ***	1,0485	-0,0165 ***	0,9836
Gender						
Female						
Male	0,1123	1,1188	0,1868	1,2054	0,0739	1,0767
Birth Weight						
< 2,5 Kg						
≥ 2,5 Kg	-0,8923 ***	0,4097	-0,7754 ***	0,4605	-0,9839 ***	0,3738
Birth Order						
1						
2	0,0702	1,0727	1,0191	2,7707	-0,3483	0,7059
3	-0,0019	0,9981	1,0573	2,8785	-0,4958	0,6091
4+	0,4891	1,6309	1,6087	4,9963	-0,0826	0,9208
Expenditure Quintile						
Q1						
Q2	-0,0260	0,9743	-0,0675	0,9347	0,0257	1,0261
Q3	-0,2014	0,8176	-0,0534	0,9480	-0,3086 *	0,7344
Q4	-0,0735	0,9291	0,1218	1,1295	-0,2338	0,7915
Q5	-0,2581 *	0,7725	-0,0143	0,9858	-0,3864 **	0,6795
Sanitation						
Proper						
Not Proper	-0,0497	0,9515	0,2548	1,2902	-0,2473 *	0,7809
Location						
Urban						
Rural	0,1882 **	1,2071	0,2542 *	1,2894	0,1886 *	1,2075
Primary Caregiver						
Mother						
Father	-0,0065	0,9935	0,4879	1,6290	-0,3298	0,7191
Grandparents	-0,1223	0,8848	0,0696	1,0721	-0,3989	0,6710
Others	-0,6526	0,5207	-0,6806	0,5063	-0,9610	0,3825

Source: IFLS 4 and IFLS 5, compiled

The research results in children aged 24-59 months showed that consistently increasing the mother's CESD-10 score could increase the child's risk of stunting. The increase in maternal CESD-10 score did not change even though other variables were included in the model. This result means that other variables do not limit the increase in the mother's CESD-10 score related to with under-five stunting. This result is in line with Claire et al., (2019) 's research in South Africa, which states that the increased risk of stunting is not solely due to the household's social or economic environment. The effects of a mother's depressive symptoms have a long-term impact on her child's health. This increase in the CESD-10 score will increase the chances of children becoming stunted. This reason may be due to the low positive influence of mothers, which harms children. This effect is related to the mother's age when having children under five. In this case, there are still quite a few mothers who give birth at a very young age, especially in the 24-59 month age group.

Shafieian et al. (2013), stated that maternal age is associated with the child's nutritional status. This result is related to the mother's increasing age, and it is assumed that there will be more experience and decision-making ability in providing nutrition to children (Richards et al., 2013). This statement is in line with the results for the child group aged 0-59 months. In the highest education, the results showed that mothers who completed at least high had a significant negative association with the child's stunting status. The higher the level of mother's education, the lower the tendency for children under five to experience stunting in the 0-59 months and 24-59 months age groups. Education is a crucial factor in improving childcare abilities. This state relates to the mother's ability to absorb information and apply it to childcare. Consistently, increasing the mother's height reduces the tendency for children to experience stunting without being limited by other variables. These results corroborate several previous studies by Upadhyay & Srivastava (2016), in India, Kim et al. (2017), in parts of South Asia, and Beal et al. (2018), in Indonesia, which state that the level of education and posture of the mother is directly proportional to the nutritional status of

children.

The duration of breastfeeding is significantly associated with stunting status in children. This state indicates that the longer the child is breastfed by the mother, the greater chance of being stunted. Although the effect was small, it was a little surprising. Pulungan (2018) , concluded that breastfeeding is related to the diversity of children's diets and welfare levels. Pulungan explained that households with a low welfare level usually carry out the long duration of breastfeeding. The longer the duration of breastfeeding tends to reduce the intake of solid food, resulting in insufficient nutrition for children. Child age consistently provides a negative and significant association with the incidence of under-five stunting. Although the effect is minimal, these results indicate that with increasing children's age, nutritional status can be improved (Pulungan, 2018). Consistent results are also shown by the children under five birth weight having a negative association in the three groups under five. Internal factors associated with stunting children in developed and developing countries come from low birth weight (Stewart, 2007). The child's low weight at birth can increase the risk of morbidity and mortality, and it is an indicator of maternal health, the nutritional status of children, and household welfare (Cutland et al., 2017; Simbolon et al., 2019).

Regarding household characteristics, the expenditure quintile shows that a higher expenditure has a greater chance of reducing stunting status for children under five. The expenditure quintile approach illustrates this household income. Apart from reporting bias, household expenditures can describe the condition of welfare in the long term (Wemakor & Mensah, 2016). The higher the income, the more varied the choices in food consumption, access to health facilities, so that the risk of infection decreases and sanitation condition becomes better, which has an impact on increased nutritional status. In both developed and developing countries, family income will be associated with children's health conditions (Beal et al., 2018; Shafieian et al., 2013; Stewart, 2007). Also, the group of children aged 24-59 months with proper sanitation conditions or having a lavatory equipped with a septic tank

has a lower risk of stunting. A clean and healthy environment supports children's growth and development for the better, especially when older children are integrated into their territory. This result is related to adequate space and sanitary conditions. Latrines or disposal sites that are not up to standard, dirty environments, can cause various disease problems, increasing the risk of children experiencing low nutritional status (Beal et al., 2018; Danaei et al., 2016; Ricci et al., 2018; Upadhyay & Srivastava, 2016). Research conducted by Pulungan (2018), in Indonesia found that children who are at risk of experiencing stunting come from households with inadequate sanitary conditions. Children who live in rural areas tend to have a higher association of stunting than children living in urban areas. These results are in line with the research results of Jayachandran & Pande (2017), Kanjilal et al. (2010), and Upadhyay & Srivastava (2016). This state is related to the environment's culture (Wolfe & Behrman, 1982). Culture is associated with different child care and feeding patterns between rural and urban areas (Abuya et al., 2012; Jayachandran & Pande, 2017; Kanjilal et al., 2010).

Conclusion

The majority of mothers experiencing depression symptoms in 2007 increased in 2014 in line with the mother's advancing age. The increase in mothers' CESD-10 score significantly increased the risk of children under five experiencing stunting, especially in the 0-59 months and 24-59 months age group. In the 0-23 month age group, although it has a favorable chance of increasing the risk of stunting, it is not statistically proven. In this group, the relationship between the increase in the mother's CESD-10 score was not strong enough compared to other variables. This study shows that the relationship between increasing the CESD-10 score in mothers can increase the risk of stunting in children. Therefore examination and depression treatment remains to be done. Health assessment and screening mental health in pregnant women and giving birth can be done routinely at related health facilities. Maternal age has a negative association with stunting, so monitoring teenage pregnancy is increasingly essential. Mothers who experience

depression need help from others in childcare. Therefore it is necessary to strengthen the support system in the family and environment. The first thousand days of life are significant in determining the future. Still, the period after that, especially in the first five years, is equally essential. The focus on nutrition and other related factors is carried out on an ongoing basis. This study still has limitations. In this study, depressive symptoms are measured using the CESD-10 instrument with self-reported depression symptoms without a diagnosis by related health professionals. Also, in this study, the availability of data on children under five with stunting and maternal depression has an extended period. The number of samples that can be observed is less, and we cannot see the condition of postpartum depression. Therefore, the suggestion for further research is to consider the situation of postpartum depression experienced by mothers on the stunting status of children under five.

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