

## The relationship between the history of low birth weight babies and the growth and development of children 1-2 years old

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### Abstract

**Background:** Birth weight is an important indicator and prognostic factor for the health of newborns. Low Birth Weight (LBW) causes asphyxia, hypothermia, infection and growth and development disorders. Babies with LBW have the risk of experiencing growth and development disorders in the future. This study aims to see the extent of the risk of growth and development disorders in children with a history of LBW.

**Method:** Methods in this study used an observational retrospective cohort design. The affordable population in this study were children aged 1-2 years in the working area of Puskesmas Wates. For children who had a history of LBW samples taken by purposive sampling and for children who had a history of normal birth weight samples taken by accidental sampling with samples of 70 respondents. Data obtained from KIA book, KMS card and the results of measuring results development used KPSP. Data analysis used chi-square test.

**Results:** 65.7% of children aged 1-2 years with a history of LBW experienced growth and development disorders, while 28.6% of children aged 1-2 years with a history of LBW experienced growth disorders and 31.4% experienced development disorders. Statistical tests obtained a p-value of growth = 0.002 and relative risk (RR) = 2.3 (95% CI 1.293-4.091). Statistical tests obtained a p-value of development = 0.004 and relative risk (RR) = 2.1 (95% CI 1.213-3.605).

**Conclusion:** The conclusion of this study shows that children aged 1-2 years with a history of LBW are 2.3 times more likely to experience growth disorders and 2.1 times more likely to experience developmental disorders.

**Keywords:** Low Birth Weight; Development; Growth.

### INTRODUCTION

Newborns weighing less than 2500 g have a higher risk of neonatal morbidity and mortality, malnutrition in the first year of life, susceptibility to infections, respiratory distress and traumas during childbirth, and development of chronic non-communicable diseases (NCDs) (1). The estimated relative risk of low birth weight for neonatal mortality is almost 200 times higher when compared with newborns with adequate birth weight (2). The Indonesian Pediatrician Association (IDAI) stated that around 5% to 10% of children are estimated to experience developmental delays (3). Data on the prevalence of stunting in Kulon Progo was 16.38%, where this figure shows that Kulon

Progo has the 2nd highest stunting rate. In addition, the prevalence of protein energy deficiency in Kulon Progo is ranked first with a figure of 12.33% (4). Birth weight or size at birth is an important indicator of the child's vulnerability to the risk of childhood illnesses and diseases. Low birth weight is closely associated with fetal and neonatal morbidity, inhibited growth and cognitive development, and chronic diseases in life (5).

One of the factors that affect growth and development is birth weight. LBW has a risk of experiencing growth and developmental disorders in the future (6). These disorders will occur in the first years of life of children with a history of LBW (7). The incidence of LBW in Indonesia in 2018 was 6.2%. The

number of LBW in Indonesia has not decreased. This can be seen from the proportion of birth weight 2007-2018: in 2007, the proportion of LBW was 5.4%; in 2010, the proportion of LBW was 5.8%; in 2013, the proportion of LBW was 5.7% (8). Those who survived from low birth weight have impaired immune function and increased risk of disease; they are likely to remain undernourished, with reduced muscle strength, throughout their lives, and to suffer a higher incidence of diabetes and heart disease (5)

The LBW rate in the Special Region of Yogyakarta Province is ranked fifth highest, with an LBW rate of 8.5% (8). In 2017, the LBW rate in Kulon Progo was 6.69%. Since 2014, the LBW rate in Kulon Progo has been the highest compared to the other four districts in the Special Region of Yogyakarta. Based on the results of a preliminary study from data from the Special Region of Yogyakarta Provincial Health Office in 2018, the incidence of LBW in Kulon Progo was 360 out of 5,086 births. In Kulon Progo Regency, LBW incidents often occur in the Wates District.

From the explanation above, the author is interested in knowing the relationship and magnitude of the risk of growth and development disorders in children aged 1-2 years with a history of LBW.

**METHOD**

This study is an analytical study with a retrospective cohort approach. The sample of this study was children aged 1-2 years with a history of LBW and NBW—sampling with two methods. In the LBW sample, a purposive sampling technique was used with a sample size of 35. In the NBW sample, an accidental sampling technique was used with a sample size of 35. Data collection used primary data, namely the results of child development examinations using KPSP, which measures socialization and independence, fine motor skills, gross motor skills, speech and language, and used secondary data from KMS in children aged 1-2 years and 2017-2018 LBW data in the Wates Health Center work area. The data analysis used was

univariate and bivariate analysis with the Chi-Square Test. This study has obtained a research permit from the Ethics Committee of the Faculty of Medicine, Nursing and Public Health UGM with the number KE / FK / 1301 / EC / 2019.

**RESULTS**

Based on the chi-square calculation results with a value of  $\alpha = 0.05$ , the p-value = 0.002 was obtained. Because the p-value (0.002)  $< \alpha$  (0.05), then H0 is rejected, so it can be concluded that there is a relationship between a history of LBW and growth conditions. The RR value is 2.3 (CI 95% 1.293-4.091), which can be interpreted as the risk of children with a history of LBW experiencing growth disorders 2.3 times greater than children with a history of LBW. In the general population, it is believed by 95% that LBW increases the risk of growth disorders by 1.293 times to 4.091 times greater than children aged 1-2 years with a history of LBW.

**Table 1.** Relative Risk of Growth Disorders in Children Aged 1-2 Years (n=70)

Birth Weight	Growth						RR (CI%)
	Abnormal		Normal		Total		
	n	%	n	%	n	%	
LBW	23	65.7	12	34.3	35	50	2.3 (1.293 - 4.091)
NBW	10	28.6	25	71.4	35	50	-

Based on the chi-square calculation results with a value of  $\alpha = 0.05$ , the p-value = 0.004 was obtained. Because the p-value (0.004)  $< \alpha$  (0.05), then H0 is rejected, so it can be concluded that there is a relationship between a history of LBW and developmental conditions. The RR value is 2.09 (CI 95% 1.213-3.605), which can be interpreted to mean that children with a history of LBW have a risk of experiencing developmental disorders 2.09 times greater than children with a history of LBW. In the general population, it is believed by 95% that LBW increases the risk of developmental disorders

by 1.213 times to 3.605 times greater than children aged 1-2 years with a history of LBW.

**Table 2.** Relative Risk of Developmental Disorders in Children Aged 1-2 Years (n=70)

Birth Weight	Development						RR (CI%)
	Abnormal		Normal		Total		
	n	%	n	%	n	%	
LBW	23	65.7	12	34	35	50	2.09 (1.213-3.605)
NBW	11	31.4	24	68.6	35	50	

## DISCUSSION

Based on the chi-square calculation results with a value of  $\alpha = 0.05$ , there is a relationship between a history of LBW and growth conditions. The RR value is 2.3 (CI 95% 1.293-4.091), which can be interpreted as the risk of children with a history of LBW experiencing growth disorders 2.3 times greater than children with a history of LBW. Based on systematic review and meta-analysis of studies, Children, under-five years of age, born LBW had 4 points lower motor scores compared to children with NBW (WMD -4.16, 95% CI; - 5.42, - 2.89) (n = 2325, I<sup>2</sup> = 44.7%) (Fig. 4). Among children < 10 years of age, 23% (95% CI; 10–35%) of LBW children had motor impairment (defined as either presence of signs of motor dysfunction on clinical examination or motor quotient of < 85) as opposed to 5% of normal birth weight children (95% CI; 1–8%). The risk of motor impairment in children born LBW was around 3 times higher compared to those born NBW (RR 3.32; 95% CI, 1.56–7.06) (n = 312, I<sup>2</sup> = 0.0%). This metaanalysis from south Asian setting reveals significant deficits in cognitive and motor scores in children and adolescents born with low birth weight, compared to those born with normal birth weight (9)

The process of human growth and development takes place from the age of the fetus in the womb to adulthood, which is continuous and influenced by various factors that determine the quality of the growth and development of the individual (10). Problems that often arise in the growth and development of children include physical disorders, motor development, language, emotions, and behavior. Children's physical

and motor growth in the first years of life is very rapid (11). Growth disorders can result in decreased endurance and mental and brain tissue. According to research by Utami, *et al.*, children who experience growth disorders tend to experience various basic developmental disorders (12).

The factors that influence growth and development in children are hereditary factors and environmental factors. Hereditary factors are growth factors that can be inherited, namely ethnicity, race, and gender. Environmental factors consist of prenatal and postnatal (13). The prenatal environment is an environmental condition that affects the fetus in the uterus, which can interfere with the growth and development of the fetus, including nutritional disorders because the mother does not get good nutritional intake and endocrine disorders in the mother (diabetes mellitus) (14). These mothers receive cytostatic therapy and experience rubella, toxoplasmosis, syphilis, and herpes infections. Another environmental factor is radiation, which can damage fetal organs. In prenatal environmental factors, mothers who receive inadequate nutritional intake are at risk of giving birth to LBW babies (15).

LBW is a baby who weighs less than 2500 grams at birth (16). Growth disorders experienced by children with a history of LBW without congenital disorders will not be able to catch up on physical growth, especially if they experience severe chronic sequelae, do not get sufficient nutritional intake, or an inadequate care environment (17). The baby will experience growth disorders characterized by weight and height that do not meet normal criteria or standards. Low birth weight is closely related to morbidity and mortality, inhibits growth, and becomes a factor in chronic disease later in life. LBW causes growth and development disorders, asphyxia, hypothermia, and death. Babies weighing less than 2500 grams will be more susceptible to infectious diseases affecting growth (18). Children with a history of LBW are susceptible to abnormal neurological signs, coordination, and reflexes. This is caused by complications in LBW, causing motor deficits and delays in children that

indicate motor disorders. Babies who experience asphyxia or spontaneous respiratory arrest will experience impaired oxygen supply to the brain (19). In addition, the combination of decreased oxygen supply (hypoxia) and blood supply (ischemia) results in biochemical changes in the body that cause nerve cell death and brain damage. The result of this impaired oxygen supply is that some nerve tissues in the brain are impaired, causing gross and fine motor disorders (20)

This study has the advantage of presenting data in the form of relative risk of growth disorders in children aged 1-2 years with a history of low birth weight. Further research is expected to be able to investigate growth disorders specifically from a developmental aspect in children aged 1-2 years with a history of low birth weight. This study has limitations in measuring growth disorders in general. Because the measurement of developmental disorders in this study only uses the KPSP questionnaire. The developmental aspects that can be explicitly investigated are gross motor development, fine motor development, language, and social persona.

## CONCLUSIONS

There is a significant relationship between BLLR and the incidence of growth and development disorders. The risk of growth disorders in children with a history of LBW is 2.3 times greater than in children with a history of BBLN, and children with a history of LBW are at risk of experiencing developmental disorders 2.1 times greater than children with a history of BBLN. In addition, the majority of research respondents experienced growth and development disorders. The most common type of developmental disorder is motor disorder.

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## REFERENCES

1. Vilanova CS, Hirkata VN, De Souza Buriol VC, Nunes M, Goldani MZ, Da Silva CH. The relationship between the different low birth weight strata of newborns with infant mortality and the influence of the main health determinants in the extreme south of Brazil. *Popul Health Metr.* 2019 Nov 27;17(1).
2. Ottolini KM, Andescavage N, Kapse K, Jacobs M, Limperopoulos C. Improved brain growth and microstructural development in breast milk-fed very low birth weight premature infants. *Acta Paediatrica, International Journal of Paediatrics.* 2020 Aug 1;109(8):1580–7.
3. Hamat V, Trisnawati RE, Padeng EP, Junggu JP, Bandur PMY, Dewi IR. Pemberdayaan Serta Pendampingan Ibu tentang Metode Stimulasi Perkembangan Motorik Halus Balita 2-3 tahun di Pustu Waso. *Jurnal Kreativitas Pengabdian Kepada Masyarakat (PKM).* 2024 Aug 1;7(8):3516–25.
4. Kenari J. Profil Kesehatan Tahun 2022 Kota Yogyakarta Dinas Kesehatan.
5. Wubetu AD, Amare YE, Haile AB, Degu MW. Newborn Birth Weight and Associated Factors Among Mother-Neonate Pairs in Public Hospitals, North Wollo, Ethiopia. *Pediatric Health Med Ther.* 2021 Mar;Volume 12:111–8.
6. Blencowe H, Krusevec J, de Onis M, Black RE, An X, Stevens GA, et al. National, regional, and worldwide estimates of low birthweight in 2015, with trends from 2000: a systematic analysis. *Lancet Glob Health.* 2019 Jul 1;7(7):e849–60.
7. Sari IK, Tjekyan RMS, Zulkarnain M. Faktor Resiko Dan Angka Kejadian Berat Badan Lahir Rendah (Bblr) Di Rsup Dr. Mohammad Hoesin Palembang Tahun 2014. *Jurnal Ilmu Kesehatan Masyarakat.* 2018 Mar 1;9(1).
8. Laporan Riskesdas 2018 Nasional.

9. Upadhyay RP, Naik G, Choudhary TS, Chowdhury R, Taneja S, Bhandari N, et al. Cognitive and motor outcomes in children born low birth weight: A systematic review and meta-analysis of studies from South Asia. *BMC Pediatr.* 2019 Jan 29;19(1).
10. Akmillah Ilhami. Kesadaran Orang Tua tentang Pentingnya Gizi Seimbang untuk Anak. *Jurnal Tumbuh Kembang: Kajian Teori dan Pembelajaran.* 2024 May 30;
11. Setyaningrum E, tumbuh kembangindd Mp. *Tumbuh Kembang Anak Usia 0-12 Tahun Buku Ajar.* 2017; Available from: [www.indomediapustaka.com](http://www.indomediapustaka.com)
12. Catur Utami D, Nur Azizah A, Nur Azizah A. Hubungan Status Gizi Dengan Perkembangan Balita Usia 1-5 Tahun Di Wilayah Kerja Puskesmas Kutasari. *Avicenna : Journal of Health Research.* 2023 Mar 27;6(1):28.
13. Buku Konsep Keperawatan Anak.
14. Le K, Nguyen M. Armed conflict and birth weight. *Econ Hum Biol.* 2020 Dec 1;39.
15. Hidayati Fajrin D, dr Desmawati Mk, Kuntari Astriana Mg, Gz S, Siti Uswatun Chasanah Mg, Ridha Restila Mk, et al. *Gizi Kesehatan Masyarakat Penerbit CV.Eureka Media Aksara.*
16. MANUABA IC. *Gawat-darurat obstetri - Ginekologi & Obstetri-Ginikologi Sosial untuk profesi Bidan.* Jakarta: EGC; 2008.
17. Nardina, Hapsari, Hasanah, Mariyana, Triatmaja. *FullBookTumbuhKembangAnak.* Yayasan Kita Menulis; 2021.
18. Scharf RJ, Scharf GJ, Stroustrup A. *Developmental Milestones Institute for Advanced Studies in Culture.*
19. Nazi S, Abadi FA, Maghfuri ; Bahareh. Fine Motor Development of Low Birth Weight Infants at the Corrected Age of 8 to 12 months. Vol. 10, *Iranian Rehabilitation Journal.* 2012.
20. Murniati L, Taherong F, Syatirah S. *Manajemen Asuhan Kebidanan Pada Bayi Baru Lahir Dengan Asfiksia (Literatur Review).* *Jurnal Midwifery.* 2021 Feb 28;3(1):32–41.