

Research Article

Analysis of Head Circumference, Exclusive Breastfeeding, and Child Development at Kedaung Community Health Center

Dinda Putri Maharani¹, Rahmini Shabariah^{2*}, Rayhana³, Farsida⁴

¹Medical Education Study Program, Faculty of Medicine and Health, Universitas Muhammadiyah Jakarta, Jakarta, Indonesia

²Department of Pediatrics, Faculty of Medicine and Health, Universitas Muhammadiyah Jakarta, Jakarta, Indonesia

³Department of Biomedic, Faculty of Medicine and Health, Universitas Muhammadiyah Jakarta, Jakarta, Indonesia

⁴Department of Public Health, Faculty of Medicine and Health, Universitas Muhammadiyah Jakarta, Jakarta, Indonesia

*Corresponding author: rahmini.shabariah@gmail.com

ABSTRACT

Background: Head circumference is one of the indicators for assessing intracranial volume and brain growth. Development is the improvement of bodily functions and abilities, such as emotional, intellectual, and behavioral development. Breast milk is a source of intake for nutrients for newborns who can support maximum growth and development. **Purposes:** It is known that the relationship between head circumference and development with the Developmental Pre-Screening Questionnaire (DPsQ) in children aged 3 – 6 months who get breast milk or formula milk in work area of the Kedaung Community Health Center Depok City. **Methods:** The design is a cross-sectional analytic study with respondents mothers who had a child and got breast milk at least three months after birth. The sampling technique used a convenience sampling method to obtain as many as 50 mothers, and the analysis data was analyzed using statistical methods using the chi-square test. **Results:** Children with the majority of 3 and 4 months of age were 34% each, female at 52%, breastfeeding alone at 80%, normal head circumference at 98%, and age-appropriate development in general by 90%. There was a significant relationship between head circumference size and breast milk status with DPsQ value and interpretation (p-value=0.002 OR=12.250 CI95%=4.789-31.333); (p-value=0.018 OR=8.143 CI95%=1.144-57.949). **Conclusion:** There is a 12 times greater relationship between head circumference size and development and an eight times more significant relationship between breast milk status and development in infants aged 3 – 6 months who get breast milk in the work area of the Kedaung Community Health Center Depok City.

Keywords: breast milk, development, head circumference, infant

INTRODUCTION

Growth is the changing size of cells, organs, and individuals measured in weight, length, bone life, and metabolic balance. Growth can be achieved by measuring weight and height adjusted according to the child's age. Besides that, growth can also be assessed by measuring head circumference, especially from birth to age three years, where the development of head

circumference overgrows at the age of the first six months (1). Based on RISKESDAS 2018 data on the proportion of head circle size at birth in West Java province, 19.0% of toddlers have a head circumference record, and 40% of children have a head circle of less than 33 cm (2).

Development is the improvement of bodily functions and abilities such as emotional, intellectual and behavioral development. The development includes four development areas: rough motor, fine motor, speech and language skills, socialization, and independence. Rough motion is the child's ability to perform attitudes and gestures that involve large muscles such as standing and sitting. Smooth motion is a child's ability to perform movements that involve small muscles and require coordination, such as writing and observing something. Speech and language are children's ability to communicate, respond to voices, and follow commands. Socialization and independence are the ability of the child to be independent, such as eating alone, tidying up toys, and interacting with his environment (1,3,4). Developmental Pre-screening Questionnaire/DPsQ) is a series of questions and instructions used as a developmental screening tool for children aged three months to 6 years. However, the DPsQ cannot fully detect the soft signs of future neurological disorders (5).

Brain development in children under two years of age is a critical period in child development. If there are developmental deviations, then this period is the right time to make a recovery (6). Some parts of the brain have functions related to motor and non-motor abilities. Brain development begins during the conception phase at two weeks of pregnancy. At the time of the conception phase, brain cells undergo processes of proliferation, migration, differentiation, myelination, synaptogenesis, and apoptosis. Nerve cells proliferate as much as 250,000 per minute at 7 and 8 weeks gestation. Neuron proliferation will stop at 20 weeks gestation, while the formation of synap will continue for six years. The environmental influences will largely determine the number of neuron cells that will survive. The more stimuli from the environment, the more synapses will be formed so that the number of apoptosis will decrease, and the size of a person's head circumference and brain development will increase along with the increase in synapses formed (7). Data on the incidence of developmental delays in general is still unknown, but around 1 to 3% of children under the age of 5 years are estimated to experience general delays (8). Several factors can affect children's growth and development, including breast milk, heredity, and environmental factors such as economic status and parental education (9,10).

Breast milk is a source of intake for nutrition for newborns. Much scientific evidence has shown that breastfeeding during the first six months can meet nutritional needs to grow and develop (11-13). Breast milk contains particular nutrients such as lactose, taurine, Arachidonic Acid (AA), Docosahexaenoic Acid (DHA), omega 3, omega 6, choline, and tryptophan, which are needed by the baby's brain to grow and develop optimally, and can help the synaptogenesis process and the myelination process. The more synapses between nerve cells, the more complex the ability to receive, process, store, and answer stimuli received by nerve cells (14,15). According to WHO, in 2020, only 1 in 2 children in Indonesia get breast milk for six months. Over 40% of children are too early to be given complementary foods (16). Based on Anindya's research (2019) on infants aged six months in Kaliwates, Jember, East Java, obtained the results of a relationship between breastfeeding and the size of the child's head

circumference (17). Breast milk promotes brain development, especially white matter growth (18).

Based on the data we got from the health profile Puskesmas Kedaung year 2021, there are still babies born with asphyxia (19), which is one of the risks of developmental disorders that affect the development of the baby's head circle so that it has an impact on the growth and development of children in the future (20), so we purpose of this study was to determine the relationship between head circumference size and the development of child aged 3-6 months who get breast milk at the work area of Kedaung Community Health Center Depok City in 2022.

METHODS

This study used analytic research by measuring and conducting direct interviews with respondents. It was conducted in the working area of the Kedaung Community Health Center Depok City. The population in this study was children aged 3-6 months who got breast milk at the work area of the Kedaung Community Health Center Depok City in December 2022.

The sampling technique in this study was a convenience sampling technique, where researchers sampled based on subjects that met the inclusion and exclusion criteria and were set up to a population of 50 people. How to collect data in this study by conducting interviews about characteristics (age, gender, breast milk status), DPsQ, and measuring head circumference. The tools used in this study include measuring tape, red wool, and coins. Data analysis in this study used univariate analysis on each variable and bivariate analysis on dependent and independent variables using the Chi-Square Test. This research has passed ethical approval with 371/PE/KE/FKK-UMJ/XII/2022 issued by the Health Research Ethics Commission of the Faculty of Medicine and Health UMJ.

RESULTS

Based on data from respondents of child aged 3-6 months who received breast milk at the work area of the Kedaung Community Health Center Depok City in 2022, the results were obtained. Based on table 1, it was found that the characteristics of infant subjects aged 3-6 months found that most of the respondents were at the age of 3 and 4 months (34%) with a total of 26 (52%) respondents being female. Based on the status of breast milk, the majority of respondents only got breast milk (80%), while those who got breast milk and formula milk or complementary food were 10 respondents (20%). Based on the size of the head circumference, respondents who had a normal head circumference were 49 subjects (98%), while those who had a head circumference below normal or microcephaly values were 1 subject (2%). Based on the DPSQ score, respondents who had age-appropriate development were 45 subjects (90%), while those with dubious developments were 5 subjects (10%).

Table 1. Characteristics of Respondents of Infants Aged 3 – 6 Months Who Get Breast Milk at the work area of the Kedaung Community Health Center Depok City in 2022.

Characteristics	Amount	n (%)
Age		
3 months	17	34%
4 months	17	34%
5 months	5	10%
6 months	11	22%
Gender		
Boy	24	48%
Girl	26	52%
Breast Milk Status		
Breast milk only	40	80%
Breast milk and formula or complementary food	10	20%
Head Circumference		
Normal	49	98%
Microcephaly	1	2%
Macrocephaly	0	0%
Development		
Normal	45	90%
Suspect	5	10%
Deviate	0	0%
Total	50	100%

Table 2. The Relationship between Head Circumference and Interpretation of DPSQ in Infants Aged 3 – 6 Months who get Breast milk or and Formula at the work area of the Kedaung Public Health Depok City in 2022.

Head Circumference	Development			Total	<i>p-value</i>	OR (95% CI)
	Normal	Suspect	Deviate			
Normal	45	4	0	49	0.002	12.250 (4.789-31.333)
Microcephaly	0	1	0	1		
Macrocephaly	0	0	0	0		
Total	45	5	0	50		

Based on table 2. Of the 50 subjects, 45 childrens was normal head circumference (90%) and 5 childrens (10%) was suspected DPQ. There was a significant relationship between head circumference and DPQ value and interpretation at the work area of the Kedaung Community Health Center Depok City in 2022.

Table 3. The Relationship between Breast Milk Status and Interpretation of DPSQ in Infants Aged 3 – 6 Months at the work area of the Kedaung Public Health Depok City in 2022.

Variable	Development			Total	p-value	OR (95% CI)
	Normal	Suspect	Deviat			
Breast Milk Status						
Breast Milk Only	38	2	0	40	0.018	8.143
Breast milk and formula or complementary food	7	3	0	10		(1.144-57.949)
Total	45	5	0	50		

Based on table 3. Of the 50 subjects, 45 children scored 9-10 on the DP_sQ (90%) and 5 scored less than 9 (10%). However, there was a significant relationship between breast milk status and DP_sQ value and interpretation at the work area of the Kedaung Community Health Center Depok City in 2022.

DISCUSSION

Children have particular growth and development characteristics from conception until the end of adolescence. Development is a series of changes in function and organ of maturation that are sustainable, orderly, and interconnected. Child development problems such as motor delays, speech delays, behavior deviation, autism, and hyperactivity in recent years have increased. Growth can be achieved by measuring weight and height according to the child's age; growth can also be assessed by measuring head circumference, especially from birth to age 3. Head circumference development grows rapidly in the first six months, and brain development in children under two years of age is a critical period in child development (1,6).

This research shows the relationship between head circumference and interpretation of DP_sQ developmental screening in infants aged 3 – 6 months who get breast milk status based on the results of bivariate analysis using the Chi-square test with odds ratio 12 times greater (table 2). The results of this study are in line with research conducted by Shabariah et al. (2019) on children aged 12-36 months at Posyandu RW 03 Mustika Jaya East Bekasi, which shows that there is a meaningful relationship nine times greater between head circumference and child development with a p-value of 0.029 (21). The results of this study are also in line with the research conducted by Sunarti (2020) on children aged 1-24 months at the Siti Khadijah 1 Muhammadiyah Makassar Mother and Child Hospital, the results of a significant relationship between head circumference and child development with a p-value of 0.00 (22). In an article written by Andreia Amaro; et al (2022), stated that there is a relationship between babies who get breast milk and metabolic disorders and neurodevelopment (20).

The risk estimate in Table 3 has an odds ratio of 8.143, meaning that there was an eight times greater meaningful relationship between breast milk status and the development of a child aged 3-6 months at the Kedaung Community Health Center Depok City work area in 2022. The results of this study are in line with research conducted by Safitri (2018) on infants aged 6-12 months at the Sewon II Health Center, Bantul Regency, which shows that there is a

meaningful relationship between breastfeeding and child development with a p-value of 0.00 (20,24).

Soetjiningsih (2014) states head circumference indicates intracranial volume and brain growth. If the head circumference is below the standard limit, the brain will adjust it. Therefore, children who have a smaller head circumference often experience mental retardation. Environmental factors can influence the development of the child. Ecological factors in the form of stimulation can help children adapt to their environment. Stimulation can be given before birth or after birth. Before birth, the stimulation given is vibroacoustic stimulation that can increase fetal movement and heart rate. Examples of vibroacoustic stimulation include listening to classical music songs while stroking the mother's belly. After birth, children aged 0-3 months can be stimulated through rough movements, subtle movements, language, and personal social. Stimulation of rough movements can be done by tilting the child towards the right and left, training the child to straighten the head by stimulating the child with toys, and holding the child with his head upright. Stimulation of fine motion can be done by giving children toys so they can get to know the texture and shape of the objects held. Language stimulation can be done by inviting the baby to communicate or sing. Social and personal stimulation can be done by giving affection and pleasant impressions to the baby, such as hugs and kisses (1).

Brain development can be influenced by several factors, such as genetics, which is responsible for forming neuron cells in the brain; besides that, the influence of nutrient intake can also be responsible for the process of brain development in children. Breast milk is known to be the best food for children. Breastfeeding in children can affect intelligence compared to children who do not get breast milk due to malnutrition, which can affect physical growth and mental development (1,20).

CONCLUSION

The results of this study found that there is a meaningful relationship between head circumference size and development stage in infants and a relationship between breast milk status and the development of infants aged 3-6 months who get breast milk or formula at the work area of the Kedaung Community Health Center Depok City in 2022. The size of the head circumference and the status of breast milk have proven to be meaningfully related to development, but this study only assessed the DPsQ score in general. Hence, further research is needed regarding what aspects of development have the most influence.

ACKNOWLEDGMENTS

Thank you to the Muhammadiyah Jakarta University and Kedaung Community Health Center Depok City for providing the opportunity for researchers to conduct this research.

CONFLICT OF INTEREST

The researcher has no conflict of interest and no affiliation or connection with any entity or organization that could raise biased questions in the discussion and conclusion of the manuscript.

REFERENCES

1. Soetjiningsih. *Tumbuh Kembang Anak*. 2nd ed. Jakarta: EGC; 2014. 131–167 p.
2. Badan Litbangkes Kementerian Kesehatan RI. *Hasil Utama Riskesdas 2018 | Badan Penelitian dan Pengembangan Kesehatan. Riset Kesehatan Dasar*. 2019.
3. Oktiawati A, Julianti E, Natalia R. Stimulasi, Deteksi dan Intervensi Dini Tumbuh Kembang Anak. 2016;52.
4. Namirah A. Hubungan Pemberian ASI Eksklusif terhadap Perkembangan Motorik Halus pada Bayi Usia 6-12 Bulan di Kabupaten Pinrang Tahun 2021. Thesis. 2021.
5. Dhamayanti M. Kuesioner Praskrining Perkembangan (KPSP) Anak. *Sari Pediatr*. 2016;8(1):9–15.
6. IDAI. Pentingnya Pemantauan Tumbuh Kembang 1000 Hari Pertama Kehidupan Anak. *Ikatan Dokter Anak Indonesia*. 2017.
7. Fajrin DH, Joewono HT, Widjiati. Perbedaan Pengaruh Paparan Musik Mozart, Beethoven dan Chopin Selama Kebuntingan Terhadap Indeks Apoptosis Sel Neuron di Cerebellum Rattus Norvegicus Baru Lahir. 2015;30–40.
8. IDAI. IDAI - Mengenal Keterlambatan Perkembangan Umum pada Anak. 2016.
9. Setiyani MS. Pemberian ASI Eksklusif Pada Pertumbuhan dan Perkembangan Struktur Jaringan Keras dan Lunak Rongga Mulut Bayi. 2020;1–9.
10. Santri A, Idriansari A, Girsang BM. Faktor-Faktor yang Mempengaruhi Pertumbuhan dan Perkembangan Anak Usia Toddler (1-3 Tahun) dengan Riwayat Bayi Berat Lahir Rendah. 2014;5:63–70.
11. Kemkes. Website Direktorat Jenderal Kesehatan Masyarakat. 24 April. 2020. p. 1.
12. Aldaudy CU, Fithria. Pengetahuan Ibu tentang ASI Eksklusif. *JIM FKep Vol IV No 1* 2018. 2018;IV(1):84–91.
13. Purwanta, Zahra. Hubungan Tingkat Pengetahuan Tentang ASI Eksklusif dengan Perilaku ASI Eksklusif di Puskesmas Rendang Karangasem Tahun 2018. *Fak Kedokt Univ Udayana*. 2018;
14. Saputra AR. Peran Pemberian ASI Eksklusif terhadap Status Gizi dan Tumbuh Kembang pada Anak Usia Dini. 2016;
15. Jalal NB. Hubungan Pengetahuan Ibu Terhadap Pemberian Air Susu Ibu (Asi) Eksklusif Untuk Perkembangan Bayi. *Fak Kedokt Univ Hasanuddin Makasar*. 2017;6.
16. WHO. Pekan Menyusui Dunia_ UNICEF dan WHO menyerukan Pemerintah dan Pemangku Kepentingan agar mendukung semua ibu menyusui di Indonesia selama COVID-19. 2020.
17. Anindya IG, Salimo H, Dewi YLR. Hubungan Pemberian ASI Eksklusif Dan Status Gizi Ibu Dengan Pertumbuhan Lingkar Kepala Bayi Usia 6 Bulan. 2019;263–8.
18. Isaacs EB, Fischl BR, Quinn BT, Chong WK, Gadian DG, Lucas A. Impact of breast milk on intelligence quotient, brain size, and white matter development. *Pediatr Res*. 2010 Apr;67(4):357–62.
19. Dinas Kesehatan Kota Depok Jawa Barat. *Profil Kesehatan Puskesmas Kedaung Tahun 2021*. Depok; 2022.
20. Amaro A, Baptista FI, Matafome P. Programming of future generations during breastfeeding: The intricate relation between metabolic and neurodevelopment

- disorders. *Life Sci.* 2022 Jun;298:120526.
21. Shabariah R, Farsida F, Prameswari I. Hubungan Ukuran Lingkar Kepala dengan Perkembangan Anak Usia 12 - 36 Bulan Berdasarkan Skala Denver Development Screening Test-II (Ddst-II) di Posyandu RW 03 Mustika Jaya Bekasi Timur November 2016. *J Kedokt dan Kesehatan.* 2019;15(1):46.
 22. Sunarti, Akbar Asfar, Nadila Hafazi Alkatiri. Hubungan Lingkar Kepala Dengan Perkembangan Motorik Pada Anak Usia 1-24 Bulan Di Rumah Sakit Ibu dan Anak Sitti Khadijah 1 Muhammadiyah Makassar. *Bina Gener J Kesehatan.* 2020;12(1):21-9.
 23. Rahma M, Putri VD, Puspitasari S. Hubungan Pemberian ASI Eksklusif Terhadap Pertumbuhan Panjang Badan dan Lingkar Kepala Bayi Usia 6-9 Bulan di Posyandu Wilayah Kerja Puskesmas Ariodillah Palembang Tahun 2020. *Cendekia Med J Stikes Al-Ma`arif Baturaja [Internet].* 2021 Apr 30;6(1 SE-):37-44.
 24. Safitri D, Suherni, Rahmawati A. Hubungan Pemberian ASI Eksklusif dengan Perkembangan Motorik Kasar dan Motorik Halus Bayi Usia 6-12 Bulan Di Puskesmas Sewon II Kabupaten Bantul Tahun 2017. *Poltekkes Kemenkes Yogyakarta;* 2018.