

The Association Between Breastfeeding Duration and Language Development Survey (LDS) Score in Children Aged 18 - 35 months

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Abstract

Background: The World Health Organization (WHO) campaign on breastfeeding as the best source of nourishment for new-born and young children has contributed to increase public's concern about the practice. Furthermore, several medical studies showed the benefit of breastfeeding on children's cognitive function, including language development. However, most of the language assessment tools used in such studies had limited ability in identifying children's language delay. Language Development Survey (LDS), as a recently developed assessment tool, is expected to provide more detailed information in the area especially related to treatment strategy purposes. This study was aimed to examine the association between breastfeeding duration and children's LDS score.

Methods: This cross-sectional study collected data from 286 breastfeeding mothers with children aged 18-35 months old. Children with delayed growth were excluded from the study. Data on breastfeeding duration (BF) and subjects' characteristics were obtained using a questionnaire. Mother's Body mass index (BMI) and children's weight-for-age were measured as proxies for nutritional status. The LDS-word checklist was administered to assess children's vocabulary and phrase development. Multiple logistic regression analysis was used to examine the association.

Results: The findings revealed that 158 children (55.2%) were breastfed for more than 18 months (BF > 18 mos), 78 children (27%) for 7-18 months (BF 7-18 mos) and 50 children (17.5%) for 6 months or less (BF ≤ 6 mos). Language delays were detected in 91 (31.8%) children (scores on LDS-vocabulary) and in 51 (35.7%) children (scores on LDS-phrase). Breastfeeding duration did not associate with the occurrence of language delay based either on LDS-vocabulary or on LDS-phrase score criteria. In comparison with BF ≤ 6 mos, BF 7-18 mos had adjusted OR (aOR) for language delay of 0.86 (0.30 to 2.47, p 0.79) based on vocabulary score and aOR 0.8 (0.18 to 3.55, p 0.78) based on phrase score, while > 18 months had aOR of 0.57 (0.23 to 1.42, p 0.23) and aOR 0.46 (0.14 to 1.67, p 0.25), respectively.

Conclusion: Breastfeeding duration was not associated with the occurrence of language delay. This observation merits further investigations on duration in each breastfeeding time and prospective studies to investigate its association with children language development.

Introduction

It is a widely held view that breastfeeding benefits children's immune system as well as determines their health and physical growth. Although any duration of breastfeeding may benefit children, many studies showed that six months of exclusive breastfeeding provide health advantages that extend not only during childhood but also throughout adulthood[1]. However, in terms of cognitive development, the impact of breastfeeding duration particularly on children's language development is still an ongoing debate. Several studies argue that the apparent advantage of 'longer duration' of breastfeeding on language development were often confounded by other factors, such as social demographic contexts. These factors should be taken into account in the analysis. Furthermore, children's language development was rarely assessed

thoroughly. Some studies tried to capture and present findings about associations between breastfeeding and children development, but they generally did not focus on language development as the studies' main objectives.

Currently, Pre-screening Developmental Questionnaire or Denver Developmental Screening Test (DDST) is the most widely applied assessment tool to assess children's cognitive and language development, especially in Indonesia. However, some scholars criticize the tool's limitation in determining comprehensive language assessment. This tool only assesses children's language development using 1–2 questions only, which resulting in a non-specific diagnosis and recommendation about children's language ability. Thus, there is a possibility of delayed diagnosis of children's language development problems. Based on the DDST restraints, we argue that it is crucial to apply a more comprehensive method to assess, diagnose, and further provide recommendation related to children's language development.

In order to address this concern, Language Development Survey (LDS), which has been scientifically proven for its excellent test–retest reliability and internal consistency, and a high sensitivity and specificity for the identification of language-delay in toddlers through its detail and specific words or vocabularies lists, was employed in the current study. Furthermore, the LDS' advances in identifying children language development has been confirmed by a number of studies at various contexts including in Korea [2], Italy [3], and Poland [4]. By employing LDS the current study expects to reveal a more comprehensive data of children's language development in Indonesian context which is still underexplored, especially when the development is attached to the breastfeeding practice. Thus, in the present study, we investigated the association between breastfeeding duration and children's language development as assessed using LDS.

Methods

Study population and location

The study was conducted consecutively in four District Public Health Centers (Puskesmas) in South Sulawesi, Indonesia, which include Puskesmas Samata in Gowa, Puskesmas Wara in Palopo, Puskesmas Bulukunyi in Takalar, and Puskesmas Bontomate'ne in Jeneponto. All studied children were between 18 and 35 months and had been or currently being breastfed during the data collection period (December 2016 to January 2017 in Gowa and Palopo and 1 November to 31 December 2019 in Takalar and Jeneponto). Children diagnosed with delayed development were excluded from the study. A written informed consent was obtained from the mothers as an agreement to participate in the study (figure 1). In total, 286 children were included in this study i.e., 76 from Samata, Gowa; 94 from Wara, Palopo; 70 from Bulukunyi, Takalar; and 46 children from Bontomate'ne, Jeneponto.

Participants

Questionnaire

Data about breastfeeding duration was obtained using a questionnaire. Based on this information, the breastfeeding duration was classified into three groups, less than 6 months; 6 to 18 months; and more than 18 months. Additional questionnaire was applied to assess demographics data including mother and children status. Mothers' status such age, occupation, family income, family language, mother's health condition during breastfeeding period (diseases or illnesses [yes/no]), pregnancy information (frequency, a number of antenatal care visits [sufficient if ≥ 3 visits or insufficient if < 3 visits during pregnancy] and methods of delivery)[5][6], and whether there was family support for breastfeeding [7][8]. They were also asked regarding their breast milk production (yes/no)[9]. Formula promotion was determined based on mothers' exposure to information of formula milk from healthcare professional. Mother breastfeeding knowledge was grouped into sufficient (correct answer was more than 5 of total number of questions) and insufficient knowledge (correct answer was less or equal to 5 of total number of questions) [8] while mother's breastfeeding practice was categorized into good (mother performed 3 or 4 breastfeeding practices components, average (mother performed 2 breastfeeding practices components, and poor (mother performed only one breastfeeding practice component) [10]. Family's smoking habit was classified into yes or no depends on whether a family member smokes or not. Additional information about children such as their birth weight, health status, order and a total number of children in the family were obtained via a questionnaire. Next, children were classified into whether they had a disease during breastfeeding period or not. All questionnaires were filled out assisted by a skilled enumerator.

Anthropometric measurement

Mother's weight and height were measured using Omron Digital Weight Scale and GEA Medical Microtoise stature meter. Body mass index (BMI) of the mother was calculated using the BMI formula ($BMI = \text{kg}/\text{m}^2$) where kg is mother's weight in kilograms and m^2 is her height in meters squared[11]. Children's nutritional status was classified into severely underweight ($< -3SD$), underweight ($-3SD$ to $< -2SD$), normal ($-2SD$ to $1SD$), and risk for overweight ($> 1SD$) using weight-for-age Z-Score Table according to the Ministry of Health Guidelines on Children's Nutritional Status[12].

Language Development Survey (LDS)

To identify children's language ability, this study employed and adapted Language Development Survey (LDS). The survey was developed by Leslie Rescorla in 1989 as an alternative to previously designed language assessment tools which she claimed inefficient and inadequate to measure children's language ability. The survey, which was designed as a screening tool and to be completed by parents (especially mothers), can identify children language (vocabulary and phrase productions) as well as to predict a potential language delay in children aged 18-35 months. In 1989 and 2001, a validation study of LDS were conducted and showed high correlation with three other similar assessment tools [13][14] LDS-vocabulary contains 310 vocabulary words arranged according to semantic category. Parents' answers on the survey represent words or vocabularies uttered by their children. The total number of words or vocabularies will then be summarized by a skilled enumerator to calculate the LDS-vocabulary score. We

also instructed parents whose children aged 24 months or older to mention five longest and best phrases that they children can produce. The average number of words for the five phrases were calculated to assess their LDS-phrase score. Interpretations of LDS scores, both vocabularies and phrases, were conducted by grouping children based on their age and gender. Children's LDS-vocabulary was scored based on children's age groups (i.e. 18-23 months, 24-29 months, or 30-35 months). Similarly, children LDS-phrase was scored based on their age groups (i.e. 24-29 months and 30-35 months)[13]. Furthermore, a mean score technique was applied to asses children's LDS-phrase production. [13]

Statistical analysis

The data is descriptively presented in mean \pm standard deviation for normally distributed data, median (interquartile range, IQR) for non-normally distributed data, and frequency (percentage of collected data). Comparison of prevalence rate among different BF duration groups was calculated using Pearson's chi square. The association of BF duration and LDS score (both vocabulary and phrase score) was examined using (uni - and multivariable) logistic regression analysis. First, model 1 (crude model) was conducted to see an unadjusted association between the determinant and the outcome. Then, several potential confounders factors were consecutively included in model 2 (age of mother), model 3 (model 2 + occupation), and model 4 (model 3 + family income + number of children). The model 4 was considered as the fully adjusted model. The adjustments from model 1 to model 4 were directed to evaluate changes in the odd ratio and the result showed considered significant at $p < 0.05$. All statistical analyses were conducted using IBM Statistical Package for Social Sciences (IBM SPSS Statistics for Windows; IBM Corp., Armonk, New York, USA) version 26.

Result

Characteristics of subjects

Among 286 children in this study, the majority were breastfed for more than 18 months ($n = 158, 55.2\%$). The number of children who were breastfed for 7–18 months and ≤ 6 months were 78 (27%) and 50 (17.5%), respectively. The mean age of the children was 26.51 ± 5.1 months. Most mothers were household wives with a low to moderate family income (less than one million up to three million rupiahs per month) and had normal BMI (24.88 ± 12.65) with mean age of 30 ± 6.1 years old. The overall prevalence of undernourished and severely undernourished children was 18.8% and 6.5%, respectively. The proportion of severely undernourished children was the highest in children who were breastfed for 7–18 months (13%) whereas overweight was seen 6.1% in BF group ≤ 6 months. In line with family supports during breastfeeding, most mothers (57.7%) confirmed these supports and their breastfeeding practices were predominantly classified as good (45.8%). Moreover, mother who received less formula promotion and have adequate human milk production appeared to have the longest BF duration (more than 18 months). During breastfeeding period, the health status of the mothers was similar across BF duration groups as well as the children's health status. Apparently, having only one child in the family would influence the BF duration. In a family with two children, the highest prevalence of breastfeeding

duration was 7–18 months whereas in the single child family the duration is longer. However, the order of children did not differ among the BF duration groups.

Table 1
Subject Characteristics

Variables	≤ 6 months (n = 50)	7–18 months (n = 78)	> 18 months (n = 158)	p value
Mother's and family characteristics				
Age (median,iqr)	31 (19–48)	30(17–50)	30 (18–75)	0.23 ^a
BMI (median,iqr)	22.7(15–35)	23.3 (15–160)	23.15 (9.5–157.5)	0.76 ^a
Mother's working status (n,%)				0.04 ^b
Government Officer	3(10.7)	3(7.3)	6(6.3)	
Non-Government Officer	0	2(4.9)	6(4.7)	
Household wife	24(85.7)	35(85.4)	87(68.5)	
Others	1(3.6)	1(2.4)	26(20.5)	
Family income(n,%)				0.28 ^b
< 1 million (idr)	16 (32)	30 (38.5)	63(40.1)	
1–3 billion (idr)	21(42)	34(43.6)	74(47.1)	
> 3 billion (idr)	13(26)	14(17.9)	20(12.7)	
Mother health status				0.47 ^b
Healthy	15(53.6)	16(39)	48(47.1)	
Sick	13(46.4)	25(61)	54(52.9)	
Pregnancies history (n,%)				
Number of antenatal care visit (n,%)				0.33 ^b
Sufficient	24(88.9)	35(89.7)	80(80.8)	
Insufficient	3(11.1)	4(10.3)	19(19.2)	
Number of pregnancy (n,%)				0.22 ^b

^aKruskal Wallis for numerical data, ^bPearson's chi square for categorical data

Iqr: interquartile range

z-weight-age: z score weight per age

Variables	≤ 6 months (n = 50)	7–18 months (n = 78)	> 18 months (n = 158)	p value
1	4(14.3)	5(12.2)	29(28.4)	
2	13(46.4)	14(34.1)	38(37.8)	
3	5(17.9)	12(29.3)	20(19.6)	
More than 3	6(21.4)	10(24.4)	15(14.7)	
Method of delivery (n,%)				0.38 ^b
Vaginal birth	24(85.7)	33(80.5)	91(89.2)	
C – Section	4(14.3)	8(19.5)	11(10.8)	
Children's characteristics				
Sex (n,%)				0.52 ^b
Boy	28(56)	39(50)	74(46.8)	
Girl	22(44)	39(50)	84(53.2)	
Birth weight in grams (median, iqr)	3000 (1900–3800)	3000 (2500–4500)	3000(1450–4200)	0.54 ^a
z-Weight - age (n,%)				0.07 ^b
Well nourished	40(81.6)	50(64.9)	108(70.5)	
Undernourished	5(10.2)	17(22.1)	56(19.9)	
Severe-undernourished	1(2)	10(13)	23(8.2)	
Overweight	3(6.1)	0	4(1.4)	
Number of sibling (n,%)				0.45 ^b
1	14(28)	17(21.8)	53(33.5)	
2	20(40)	32(41)	54(34.2)	
≥ 3	16(32)	29(37.2)	51(32.3)	
Order of Children(n,%)				0.94 ^b

^aKruskal Wallis for numerical data, ^bPearson's chi square for categorical data

lqr: interquartile range

z-weight-age: z score weight per age

Variables	≤ 6 months (n = 50)	7–18 months (n = 78)	> 18 months (n = 158)	p value
1	19(38)	24(30.8)	54(34.3)	
2	15(30)	28(35.9)	52(32.9)	
≥ 3	16(32)	26(33.3)	52(32.9)	
Children health status (n,%)				0.58 ^b
Healthy	9(32.1)	11(26.8)	23(22.8)	
Sick	19(67.9)	30(73.2)	78(77.2)	
Breastfeeding history				
Perceived breastmilk production (n,%)				0.25 ^b
Sufficient	24(85.7)	39(95.1)	96(94.1)	
Insufficient	4(14.3)	2(4.9)	6(6.59)	
Mother's breastfeeding knowledge (n,%)				
Sufficient	27(96.4)	40(97.6)	98(97)	0.96 ^b
Insufficient	1(3.6)	1(2.4)	3(3)	
Exposure to formula promotion (n,%)				
No	15(53.6)	27(65.9)	74(72.5)	0.16 ^b
Yes	13(46.4)	14(34.1)	28(27.5)	
Mother's breastfeeding practice (n,%)				0.15 ^b
Good	22(48.9)	28(35.9)	81(51.3)	
Average	10(22.2)	24(30.8)	44(27.8)	
Poor	13(28.9)	26(33.3)	33(20.9)	
Family support (n,%)				

^aKruskal Wallis for numerical data, ^bPearson's chi square for categorical data

lqr: interquartile range

z-weight-age: z score weight per age

Variables	≤ 6 months (n = 50)	7–18 months (n = 78)	> 18 months (n = 158)	p value
Yes	26(92.9)	38(92.7)	101(99)	0.09 ^b
No	2(7.1)	3(7.3)	1(1)	
Mother's and family				
Family language (n,%)				0.51 ^b
National Language	30(60)	37(47.4)	73(47.4)	
Local Language	9(18)	20(25.6)	44(28.6)	
Mix Language	11(22)	21(26.9)	37(24.0)	
Smoking status in family member (n,%)				0.97 ^b
Yes	7(25)	9(22.5)	24(23.8)	
No	21(75)	31(77.5)	77(76.5)	
^a Kruskal Wallis for numerical data, ^b Pearson's chi square for categorical data				
Iqr: interquartile range				
z-weight-age: z score weight per age				

The association of breastfeeding duration and the event of delayed LDS vocabulary and phrase score

After analyzing the 286 children LDS vocabulary score, the data revealed that 91 children (31.8%) had language delay based on their LDS-vocabulary score. The highest percentage of children with delayed vocabulary development according to their ages was from BF group of 7–18 months (33.3%). Then, we investigated the association between BF-group and LDS-vocabulary score. We found a similar prevalence in normal vs delayed LDS vocabulary score across different BF duration groups (p-value 0.937) (Table 2).

LDS phrase score was assessed in the subset of children (24–35 months). The prevalence of delayed LDS phrase-score was 35.7% which was parallel to LDS-vocabulary, the highest delayed LDS-phrases also presented in the BF group of 7–18 months (39.5%). Next, the association between breastfeeding duration and the event of delayed LDS phrase score was similar within BF groups (p-value 0.849) (Table 2).

Table 2
Language development survey (LDS) score categories by breastfeeding duration groups

Variables	Total	≤ 6 months	7–18 months	> 18 months	p value
LDS-vocabulary ^a (n = 286)					0.937
Normal	195 (68.2)	34(68)	52(66.7)	109(69.0)	
Delayed	91 (31.8)	16(32)	26(33.3)	49(31.0)	
LDS-phrase ^{b,c} (n = 143)					0.849
Normal	92(64.3)	19(65.5)	23(60.5)	50(65.8)	
Delayed	51(35.7)	10(34.5)	15(39.5)	26(34.2)	
^a LDS–vocabulary categories were based on analysis of all subjects (n = 286)					
^b LDS-phrase categories were based on analysis of children aged 24–35 months (n = 143)					
^c Missing data for total phrase was 30%					
Interpretation of LDS-vocabulary and LDS-phrase scores were adjusted according to children's sex and age.					

Association of breastfeeding duration and the occurrence of delayed vocabulary development

Next, the association of breastfeeding duration and delayed vocabulary development was analyzed using a logistic regression with adjustments for mother age, occupation, family income, and number of children. The result showed that the risk to the occurrence of delayed LDS-vocabulary score was lower in BF > 18 months group compared to the BF ≤ 6 months group, although it was not statistically significant (OR [95% CI] = 0.57[0.23;1.42], p-value 0.23) (Table 3, model 4). Model 4 was the fully-adjusted model for the association between breastfeeding duration and delayed vocabulary development (as measured by LDS-vocabulary score). Although it was not significant, the analysis showed that a longer breastfeeding duration (particularly with BF > 18 months) might effectively contribute to reduce the risk for delayed vocabulary development.

Table 3
Association of breastfeeding duration and the occurrence
delayed of vocabulary development (LDS-vocabulary
score)

Model (n = 286)	Odds Ratio (95% CI)	P value
Model 1 (Crude OR)		
≤ 6 months	Reference	
7–18 months	1.06 (0.50;2.27)	0.88
> 18 months	0.95 (0.48; 1.89)	0.89
Model 2 (model 1 + mother age)		
≤ 6 months	Reference	
7–18 months	1.01 (0.47 ;2.17)	0.98
> 18 months	0.89 (0.45;1.78)	0.74
Model 3 (model 2 + mother's working status)		
≤ 6 months	Reference	
7–18 months	1.00 (0.37;2.76)	0.99
> 18 months	0.68 (0.28;1.65)	0.39
Model 4 (model 3 + family income + number of children)		
≤ 6 months	Reference	
7–18 months	0.86 (0.30;2.47)	0.79
> 18 months	0.57 (0.23;1.42)	0.23

Association of breastfeeding duration and the occurrence of delayed phrase development by using LDS-vocabulary score

Parallel to the findings on vocabulary-LDS, we also calculated the association of breastfeeding duration to the occurrence of delayed LDS phrase score in children aged 24–35 months. Similarly, children who were breastfed longer had lower odds of delayed phrase development as compared to the reference group (BF ≤ 6 months). In the fully-adjusted model, the odds of children in the BF > 18 months group were less than half the odds of those who were BF ≤ 6 (OR [95% CI] = 0.46 [0.14;1.67], p-value = 0.25) (Table 4, model 4). A huge decline of OR emerged when mother's working status variable was entered into the model. An apparent trend for smaller odds ratio as shown in our analyses model 1 to full model suggests that a longer duration BF might prevent delayed phrase development.

Following the missing data in this study, a sensitivity analysis was performed to calculate the estimate coefficients of the complete data (n = 171) and found a similar result with the total sample (n = 286). It is shown in the fully adjusted model of LDS-vocabulary result that the odd of BF > 18 months less than the odd of BF ≤ 6 months (OR [95% CI] = 0.61 [0.24;1.57], p-value = 0.78). Along with the result, the odd of LDS-phrase score was revealed the odd of BF > 18 months (OR [95% CI] = 0.28 [0.62;1.23], p-value = 0.09) less than the odd of BF ≤ 6 months.

Table 4
Association of breastfeeding duration and the occurrence delayed phrase development (LDS-phrase score)

Model (n = 143)	Odd Ratio (95%CI)	P value
Model 1 (Crude OR)		
≤ 6 months	Reference	
7–18 months	1.24 (0.45; 3.38)	0.68
> 18 months	0.99 (0.40;2.43)	0.98
Model 2 (model 1 + mother age)		
≤ 6 months	Reference	
7–18 months	1.17 (0.42; 3.25)	0.76
> 18 months	0.95 (0.38 ;2.36)	0.92
Model 3 (model 2 + mother's working status)		
≤ 6 months	Reference	
7–18 months	0.71 (0.17; 2.91)	0.64
> 18 months	0.55 (0.17;1.79)	0.32
Model 4 (model 3 + family income + number of children)		
≤ 6 months	Reference	
7–18 months	0.8 (0.18; 3.55)	0.78
> 18 months	0.46 (0.14;1.67)	0.25

Discussion

The study findings suggested no association between BF duration and LDS scores but adjustments for confounders showed a possible protective effect of longer BF duration against delayed language development. Mothers' age, working status, family income, and children number of siblings were likely to affect the relation between BF duration and language development. Previous studies confirmed that the

above variables were potential confounders need to be considered to reveal the relation between BF duration and cognitive development including vocabulary improvement[15][16].

In addition, impacts of breastfeeding to cognitive development in post-infancy are still discussed in many studies. Results from previous studies, a meta-analysis, showed that breastfeeding was associated with cognitive development compared to formula feeding [17]. In 2013, a systematic review emphasized confounding factors that might influence the relationship between BF duration and cognitive development [15]. Up until now, studies on BF duration still found various result regarding the best BF duration to influence cognitive and language ability. Studies on BF duration range from less than 6 months, exclusive BF (6 months), more than 6 months, 12 months, to more than 12 months. Interestingly, some studies found BF duration 3 to 6 months was enough to support early and late years of children's language development [18][19][20][21]. Also, previous study confirmed mother who continues 6 months-BF consistently having intelligences (including vocabulary development) increased until children reach 15 years old[22]. Conversely, Iqbal et al studied the association between BF and cognitive and language development suggested the need to lengthen breastfeeding duration to more than 12 months to get significant increase on both cognitive and language development[23]. Similar to our result, although not significant, a trend to BF duration > 18 months seemed to protect children's language delay. Otherwise, a study that examined cognitive and noncognitive development of children found no association once the children reached five years old. This study also highlighted mothers' education background as an important factor that influence children's cognitive development [24][16][25]. It seemed a number of studies about BF duration and cognitive development were influenced by children age and assessment methods used.

In terms of breastfeeding duration and improvement of cognitive ability, there are two mechanisms attributed to this correlation. First, human milk contains a specific fatty acid called PUFA (DHA and ARA) that contribute to the myelination of brain neurons and to support cognitive development.[26][27]. Secondly, breastfeeding provides emotional intimacy between mother and children that stimulate positive emotional expressions, reduce antisocial and aggressive behavior that related to cognitive development of children[26].

LDS score is not commonly administered particularly to assess language development for medical and health studies. For example, a number of studies preferred other tools including Receptive and Expressive vocabulary Tests, the Denver Developmental Screening Test, Early Language Milestones (ELM) and the Receptive-Expressive Emergent Language Scale (REEL) to assess children's language development [28] [24]. However, although these language screening tools have been broadly used in the paediatric settings, it does not mean that 'they are not without limitations' [29][30][31]. Some questions in these assessment tools could be too vague and leave out the most critical information regarding children's language development. For example, in ELM which seeks children's word production, the tools will only ask parents or carers whether their children able to produce a minimum of 50 words without require them to mention example of words or vocabularies that their children produce. LDS has demonstrated a much more

advanced technique in identifying, capturing, and analysing information regarding children language development.

However, it should also be noted here that as because information is exclusively acquired from parents or carers (not the children themselves), their observations on children daily interactions are crucial. Therefore, good observations will enable parents or carers to give rich information for the LDS to provide consistent and comprehensive results regarding children language development. In other words, lack of inputs from the parents or carers will potentially leave out sensitive information that could be useful to predict whether children experience mild language delays or not. For example, when the current study requesting information about children phrase production, about 30% of participant were unable to detailly provided information regarding their children phrase ability. As a consequence, although their children showed good results in their vocabulary production, the inadequate information from phrase productions could reflect other implications.

Strength and limitation

Our study emphasized on a language development by introducing the LDS as an assessment tool to reveal comprehensive information on language development of children aged 18–35 months. In particular, LDS is able to present specific language delay i.e. words and phrases that could guide to a better language therapy for children. Furthermore, LDS is considered as the best tool for measuring children language because of its effectiveness in the assessment and data analysis process which can be personally conducted and analysed by parents, carers or other parties who have interest in children language development [13].

Several limitations in our study such as small number of subjects and unavailable data on the duration and frequency of each breastfeeding influence the effect of breastfeeding duration on language development. Moreover, we did not obtain data about mothers' direct vs indirect breastfeeding practices which might have potential influence on children's language development. Lastly, the study employed a cross sectional data approach that only describe single shoot on both variables with no further follow up data.

Implication of study

This study was adding more evidence on the role of breastfeeding duration in language development of children aged 18–35 months, particularly by using LDS tool.

Conclusion And Recommendation

Our study found no significant association between breastfeeding duration and LDS score although a trend to longer breastfeeding duration seemed able to prevent delayed language development problems. We encourage more study with the use of LDS assessment tool.

Abbreviations

LDS (language development survey), BMI (body mass index), BF (breastfeeding).

Declarations

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Authors' contributions

AF collected samples, analyzed the data, and wrote the manuscript. AR collected samples, interpreted LDS score, and wrote the manuscript. SJ gave feedback to the manuscript. AS analyzed the data and provided feedback to manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The generated dataset is available to share from the corresponding author with reasonable request.

Ethics approval and consent to participate

This study was approved by the ethical committees of Faculty of Medicine, Hasanuddin University, Indonesia (ref: no.176/H4.8.35.31/PP36_KOMETIK/2017) for study sites in Gowa and Palopo districts and from the ethical committees of Faculty of Medicine and Health, Islamic State University, Indonesia (ref: no. E.010/KEPK/FKIK/XII/2019) for study sites in Jenepono and Takalar districts.

Consent for publication

Informed consent from participants were obtained before involving them in the study.

Competing interests

The authors declare they have no competing interest

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Figures

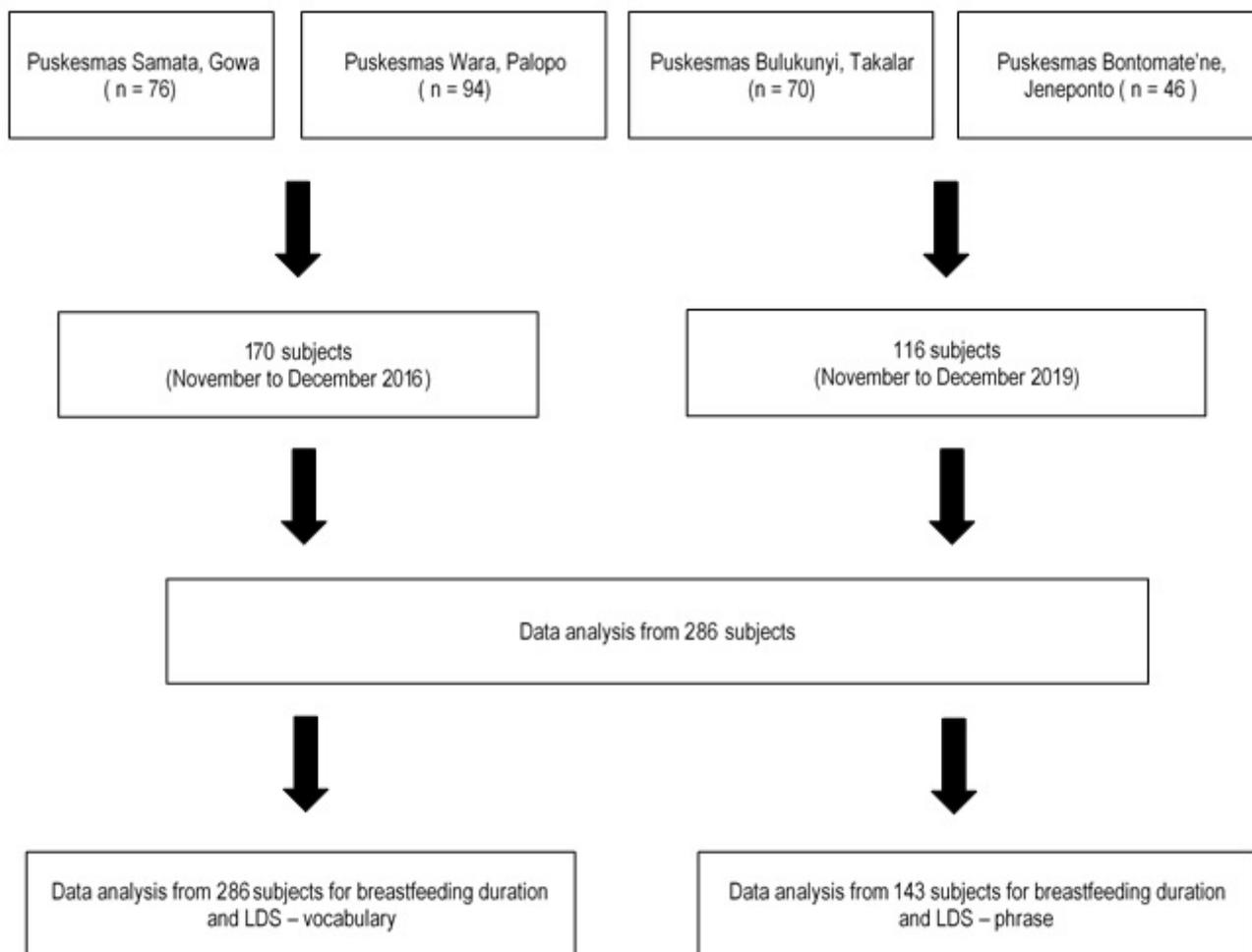


Figure 1

Flow diagram of study participants; LDS: Language Development Survey