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Factors associated with minimum dietary diversity among 6-11-month-old children in Indonesia: Analysis of the 2017 Indonesian Demographic and Health Survey

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ABSTRACT

Background and purpose: The indicators to assess food diversity in complementary feeding is minimum dietary diversity (MDD). In 2017, the proportion of MDD among 6-11-month-old children in Indonesia was 33.8%, which was the lowest among other age group and below the national rate. This study aims to explore factors associated with MDD among 6-11-month-old children in Indonesia

Methods: This study was a secondary data analysis of the 2017 Indonesia Demographic and Health Survey (IDHS), a cross-sectional study involving 17,848 children across all provinces in Indonesia. The final samples included in this analysis were 1,593 children aged 6-11-month-old. Variables analyzed were parent's education level, access to information, parent's occupation, wealth index, and access to health facilities. Logistic regression model was applied to identify factors associated with MDD.

Results: The proportion of MDD in this study was 35.1%. The highest food groups that were consumed were staple food, vitamin-A rich fruits and vegetables, and breastmilk. The final model showed factors which correlated significantly with complementary feeding practices that met MDD requirement were wealth index categorized as richer (OR=1.72; 95%CI: 1.16-2.55; p=0.007), wealth index categorized as richest (OR=2.42; 95%CI: 1.58-3.68; p<0.001) and using internet almost every day (OR=1.42; 95%CI: 1.05-1.91; p=0.023).

Conclusion: Wealth index and internet use were independently associated with MDD. Online media should be considered as channel to spread information of complementary feeding diversity to children, while socio-economic factor which associated to food accessibility should be addressed by involving beyond health sector.

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INTRODUCTION

Feeding practice contributes to child's growth and development, hence, parents ought to assure appropriate amount of nutrition to their children. World Health Organization (WHO) recommends variety of foods must be given to children to ensure that the nutrients needs are met.[1,2] Consumption of diverse diet was found to be associated with the reduction of under nutrition among children.[3]

Minimum dietary diversity (MDD) is one of the core indicators that were published by WHO and UNICEF to assess feeding practice of 6-23-month children in the population-level measurement.[4,5]

Children who meet the MDD criteria are those who received at least five or more food groups during previous day.[6,7] There are eight food groups in this indicators such as (1) grains, roots, and tubers, (2) legumes and nuts, (3) dairy products, (4) flesh foods (meat, fish, poultry, and liver/organ meats), (5) eggs, (6) vitamin-A rich fruits and vegetables, (7) other fruits and vegetables, and (8) breastmilk.[7]

According to UNICEF Global Database, the proportion of 6-11-month-old Indonesian children who met MDD in 2017 was 33.8% which was below the national proportion of all age groups (6-23 months old) at 53.9%. While, the proportions of children whom met MDD

for children age 12-15 months, 16-19 months, and 20-23 months were 60.1%, 64.3%, and 68%, respectively.[8] These figures decreased by 1.5% compared to previous survey in the same age groups in 2012.[8]

A study on MDD had been conducted among 6-23-month children in Indonesia. The result of the study shows that wealth index, number of children, assets ownership, mother's working status, and place of residence were associated with MDD.[9] Previous study in Tanzania shows that children in younger age (6-11 months old), limited access to media, and poor economic status were associated with inappropriate feeding practice.[10]

Better understanding on determinants of MDD among 6-11 months is needed to increase MDD practices and to prevent malnutrition. This study is intended to find factors associated with MDD among 6-11 month-old Indonesian children across all 34 provinces of Indonesia.

METHODS

This study is a secondary analysis of the 2017 Indonesia Demographic and Health Survey (IDHS) data. The IDHS is a cross-sectional survey conducted on 24th July-30th September 2017 in all 34 provinces of Indonesia and was implemented by Indonesian Central Bureau of Statistics (BPS) in collaboration with the National Population and Family Planning Board (BKKBN) and the Ministry of Health (MoH).[11]

The samples of 2017 IDHS were obtained from 1,970 census blocks in rural and urban areas of Indonesia. There were two stages of stratified sampling; first stage was to select the census block and second stage was to select the household.[11] The expected samples were 49,250 households, 25,300 from urban area and 23,950 households from rural area. The sampling expected to obtain 59,100 women aged 15-49 years old, 24,625 never-married men aged 15-24 years old.[12] Dataset for this analysis was children's data that contain information on the child in the pregnancy and postnatal care, immunization, and health. Sub-population that was studied in this study was all families in IDKR71FL data set who had 6-11-months-old children and met the inclusion criteria. The inclusion criteria were the child still alive, aged 6-11 months, and had complete data in the variables that related to dietary diversity, parent's education level, access to information, parent's occupation, and access to health facilities. Dataset of 2017 IDHS that used in this study was obtained from Demographic and Health Survey public domain (https://dhsprogram.com/). The data was requested on 9 November 2020 and accepted on 10 November 2020.

The dependent variable in this study was MDD, which refers to proportion of children who had eaten at least five out of eight food groups in the previous day of the data collection time.[4] The food groups were (1) grains, root, and tubers, (2)

Table 1. Children's and parent's characteristics

Variable	n	%
Children's age (months)		
6	256	16.1
7	227	14.2
8	266	16.7
9	297	18.6
10	264	16.6
11	283	17.8
Children's sex		
Male	867	54.4
Female	726	45.6
Place of residence		
Sumatera	427	26.8
Java	507	31.8
Bali, NTT, and NTB	140	8.8
Kalimantan	147	9.2
Sulawesi	237	14.9
Papua and Maluku	135	8.5
Mother's level of education		
Primary	327	20.5
Junior high	343	21.5
Senior high	569	35.7
Academy (Diploma)	100	6.3
University	237	14.9
No education	17	1.1
Father's level of education		
Primary	370	23.2
Junior high	320	20.1
Senior high	621	39.0
Academy	54	3.4
University	226	14.2
Father's occupation		
Professional/technical/managerial	155	9.7
Clerical	133	8.3
Sales	243	15.3
Agricultural	379	23.8
Industrial worker	378	23.7
Services	279	17.5
Others	10	0.6
Did not work	11	0.7
Mother's occupation		
Professional/technical/managerial	148	9.3
Clerical	87	5.5
Sales	218	13.7
Agricultural worker	116	7.3
Industrial worker	75	4.7
Services	90	5.6
Not working	858	53.9
Mother's frequency of watching television		
Less than once a week	215	13.5
At least once a week	1297	81.4
Not at all	81	5.1
Mother's frequency of using internet last month		
Less than once a week	62	3.9
At least once a week	159	10.0
Almost every day	550	34.5
Not at all	822	51.6
Wealth index		
Poorest	373	23.4
Poorer	329	20.7
Middle	288	18.1
Richer	293	18.4
Richest	310	19.5
Visited health facility last 6 months		
Yes	1155	72.5
No	438	27.5
Money is a problem to access health		
Yes	255	16.0
No	1338	84.0
Distance is a problem to access health		
Yes	218	13.7
No	1375	86.3

legumes and nuts, (3) dairy products (milk, yogurt, cheese), (4) flesh food (meat, fish, poultry, and liver/organ meats), (5) eggs, (6)Vitamin-A rich fruits and vegetables, (7) other fruits and vegetables, (8) breast milk.[6] Meanwhile, independent variables in this study were parent's education level, access to information, wealth index, parent's occupation, and access to health facilities. There are 5 categories of wealth index: poorest, poor, middle, rich, and richest. This indicator was categorized based on the assets and house characteristics. The wealth index category was already provided by DHS.

Data from IDHS dataset (N=17,848) was cleaned and analyzed using IBM SPSS version 25 software. The number of sub-populations of 6-11-month-old children was 1,961 data. Elimination process was done on cases that did not meet inclusion criteria, therefore final sub-population (n=1,593) was analyzed using bivariate and multivariate methods. In order to see sample characteristic and the prevalence

of MDD in 6-11-month-old children, a descriptive analysis was performed. Bivariate analysis was also conducted to determine association between independent and dependent variables. Bivariate analysis was performed using simple logistic regression with p<0.05. Independent variables that were found to be associated with dependent variable in bivariate analysis were used in multivariate logistic regression modelling. Odds ratio and 95% Confidence Interval (CI) was reported at p<0.05 level of significance.

This study was approved by the ethics committee from Faculty of Medicine Universitas Airlangga (KEPK FKUA on June 4th, 2021 number 104/EC/KEPK/FKUA/2021).

RESULTS

Characteristics of 6-11-month-old children and their parents
The mean age of children in this study was 8.59±1.7 months. More than half

children were male (54.4%) and one third lived in Java Island (31.8%). The most prevalent level of mother's and father's education were high school respectively 35.7% and 39%. Half of mothers (53.9%) didn't work meanwhile the most frequent father's occupation were in agricultural (23.8%) and industrial sectors (23.7%). The majority (81.4%) mothers were watching television at least once a week meanwhile half of mothers (51.6%) were not using internet at all in the last month. The household wealth index was mostly in the first quintile or poorest level (23.4%) followed by poor level (20.7%). Most of samples didn't have problem with money (84%) or distance (86.3%) to access the health facility (Table 1).

Minimum dietary diversity
Prevalence of MDD in children aged 6-11 months based on the 2017 IDHS data was 35.3%. The consumption of staple food such as grains, root, and tubers in 6-11-month-old children were the highest (89.3%) among other food category followed by consumption of breastmilk (77.4%). Consumption of animal protein from dairy product was the highest (53.6%) among other animal protein food category such as flesh foods (34.5%) and eggs (29.1%). Consumption of vitamin A rich fruits and vegetables was 61%. (Table 2)

From cross-tabulation, children who achieved MDD were most likely to consume grains, roots, and tubers (98.8%), Vitamin A rich food and vegetables (95.4%), milk products (86.1%), and flesh food (84.2%). Meanwhile, the food categories that most likely consumed by children who did not meet MDD were grains, roots, and tubers (84.2%) and breast milk (77.4%).

Minimum dietary diversity based on the children's and parent's characteristics
Factors that associated with MDD from bivariate analysis were frequency of watching television, frequency of using internet last month, wealth index, money and distance as the problem of accessing health facility, mother's occupation, also mother's and father's education level.

Mothers who watched television at least once a week (UOR=2.42; 95%CI: 1.39-

Table 2. Consumed food groups and MDD of the 6-11-month-old children

Variable	n	%
Grains, root, and tubers		
No	170	10.7
Yes	1423	89.3
Legumes and nuts		
No	1322	83.1
Yes	269	16.9
Dairy products		
No	739	46.4
Yes	854	53.6
Flesh foods		
No	1044	65.5
Yes	549	34.5
Eggs		
No	1127	70.8
Yes	464	29.2
Vitamin A rich fruits and vegetables		
No	622	39.0
Yes	971	61.0
Other fruits and vegetables		
No	1265	79.4
Yes	326	20.5
Breast milk		
No	1233	22.6
Yes	360	77.4
Minimum dietary diversity		
No	1031	64.7
Yes	562	35.3

Table 3. MDD based on children and parent's characteristics

Variables	UOR*	95%CI UOR	p
Mother's frequency of watching television			
Less than once a week	1.96	1.06-3.62	0.03**
At least once a week	2.42	1.39-4.22	<0.01**
Not at all	Ref.		
Mother's frequency of using internet last month			
Less than once a week	1.81	1.08-3.05	0.03**
At least once a week	1.52	1.06-2.17	0.02**
Almost every day	2.28	1.82-2.86	<0.01**
Not at all	Ref.		
Wealth index			
Poorest (1st quintile)	Ref.		
Poorer (2nd quintile)	1.40	1.00-2.96	0.05
Middle (3rd quintile)	1.57	1.11-2.21	0.01**
Richer (4th quintile)	2.40	1.72-3.35	<0.01**
Richest (5th quintile)	3.70	2.67-5.12	<0.01**
Visited health facility last 6 months			
Yes	1.08	0.861-1.36	0.49
No	Ref.		
Money is a problem to access health			
Yes	1.55	1.154-2.08	<0.01**
No	Ref.		
Distance is a problem to access health			
Yes	0.71	0.516-0.97	0.03**
No	Ref.		
Father's occupation			
Professional/technical/managerial	6.63	0.83-53.09	0.08
Clerical	6.46	0.80-51.97	0.08
Sales	6.25	0.79-49.61	0.08
Agricultural	3.29	0.42-26.02	0.26
Industrial worker	6.31	0.80-49.83	0.08
Services	5.44	0.69-43.07	0.11
Did not work	Ref.		
Mother's occupation			
Professional/technical/managerial	1.71	1.20-2.44	<0.01**
Clerical	1.44	0.92-2.24	0.11
Sales	1.40	1.03-1.89	0.03
Agricultural worker	0.68	0.43-1.06	0.09
Industrial worker	1.57	0.97-2.52	0.07
Services	1.32	0.85-2.06	0.22
Not working	Ref.		
Mother's level of education			
Primary	5.14	0.67-39.38	0.12
Junior high	6.96	0.91-53.15	0.06
Senior high	10.50	1.38-79.70	0.02**
Academy (Diploma)	11.02	1.41-86.28	0.02**
University	12.24	1.58-93.75	0.02**
No education	Ref.		
Father's level of education			
Primary	Ref.		
Junior high	1.30	0.94-1.81	0.11
Senior high	1.55	1.17-2.05	<0.01**
Academy	2.78	1.56-4.97	<0.01**
University	2.42	1.71-3.42	<0.01**

*UOR=unadjusted odd ratio; **statistically significant at p<0.05; Ref=reference groups

4.22; p=0.002) and using internet almost every day (UOR=2.28; 95%CI: 1.82-2.86; p<0.001) were two times more likely to give her child diverse food compared with mothers who was not watching television and using internet. Children who lived in higher quintile of wealth index had a higher odd to meet MDD compared with children who lived in the first quintile. Working mothers also had higher odd to meet MDD compared with mothers who were not working meanwhile there was no association between father's occupation and MDD. Parent's educational level also had association with MDD. Compared with mothers who did not have education, mothers with higher education level had higher odds in meeting MDD (**Table 3**).

Factors associated with minimum dietary diversity

The results of multivariate analysis showed that independent factors associated with MDD were frequency of using internet in the last month and wealth index. Mothers who use internet almost every day were 1.417 times higher to give her child complementary feeding that meet MDD criteria compared with mothers who were not using internet at all (p=0.023; 95%CI: 1.05-1.91). Wealth index was also associated with MDD. Children in rich household category were 1.721 (p=0.007; 95%CI: 1.163-2.547) times more likely to meet MDD, meanwhile the richest was 2.417 (p<0.001; 95%CI: 1.588-3.680) times higher in meeting MDD.

DISCUSSION

Based on the results of our study, prevalence of MDD among 6-11 month old children in Indonesia was 35.3%. Multivariate regression showed that wealth index and access to internet were factors that associated with MDD in 6-11-month-old children in Indonesia. Our findings indicate that more than 70% children aged 6-11 months old did not receive diverse diet because they were given less than 5 food groups. By giving 5 food groups, we can assume at least children had received staple food, animal-source food, vegetables and breastmilk.[6,7,13]

The consumption of staple food among 6-11-month-old children in this study was the highest among all food groups and was

given to more than 80% of the children. Meanwhile, consumption of animal-source foods such as flesh food (meat, poultry, fish, liver, and organ meat) and eggs were less than 35%. Study in low and middle-income countries showed consistent result with our study that inequality between the consumption of staple food and animal-source food was found.[14] This could be due to the price of animal foods that were more expensive than staple food. Consumption of animal-source foods were associated with child's growth especially in 1000 first days of life where the child's growth rate is higher compared with other life stage.[15]

Wealth index is one of the indicators to assess the level of wealth in household without using any income data instead this indicator using ownership and household characteristics.[16] Our final model shows that wealth index is associated to MDD. Children who lived in the richer household had higher likelihood to meet the MDD requirement compared to the children in the poorer household. Previous study in other countries showed significant results in the association between wealth index and MDD.[10,17] Our study also shows a consistence result with previous study in Indonesia using 6-23 months population showing a significant association between wealth index and MDD.[9] Children who lived in the higher wealth index quintile had better privilege to have more diverse foods due to wider food options and bigger buying power of the family.

Access to internet was increasingly used as the proxy indicator to describe access to information. Final logistic model shows that mothers who used internet almost every day were 1.4 times more likely to give diverse diet to her child. Previous study in India and other countries showed that access to information from mass media was significantly associated with meeting MDD criteria in children.[17-19] Mass media has crucial role in educating mothers and caregiver on appropriate complementary feeding practice especially in the diversity of food.[18]

Internet is one of mass media that grows rapidly in Indonesia. In 2017, penetration of internet in Indonesia was increasing by 51% compared to 2016 showing an increment in active internet users among Indonesian population.[20] World Bank data showed that in 2017, 32.9% of population in Indonesia were accessing internet.[21] Internet provides easy access, diverse information, and flexibility for mothers to learn on appropriate complementary feeding practice and giving diverse food to children from articles, videos, or other contents that available in the internet. By using internet, mother could increase their knowledge and practice on giving foods to her children that meet MDD. However, internet could not be accessed freely. To access or using internet, mother needs to buy internet data and have platforms such as computer or smartphone to access internet. Therefore, those who can access internet were more likely to have better economic condition. In our study, 68.7%

Table 4. Factors independently associated with MDD

Variables	AOR*	95%CI AOR	p
Mother's frequency of watching television			
Less than once a week	1.41	0.74-2.69	0.29
At least once a week	1.50	0.83-2.74	0.18
Not at all	Ref		
Mother's frequency of using internet last month			
Less than once a week	1.59	0.93-2.73	0.09
At least once a week	1.18	0.80-1.74	0.40
Almost every day	1.42	1.05-1.91	0.02**
Not at all	Ref		
Wealth index			
Poorest	Ref		
Poorer	1.17	0.81-1.68	0.41
Middle	1.16	0.78-1.71	0.46
Richer	1.72	1.16-2.55	<0.01**
Richest	2.42	1.59-3.68	<0.01**
Money is a problem to access health			
Yes	0.91	0.65-1.28	0.58
No	Ref		
Distance is a problem to access health			
Yes	0.99	0.69-1.42	0.97
No	Ref		
Mother's occupation			
Professional/technical/managerial	1.13	0.73-1.75	0.59
Clerical	0.81	0.49-1.34	0.42
Sales	1.17	0.85-1.61	0.33
Agricultural worker	1.05	0.66-1.69	0.83
Industrial worker	1.49	0.91-2.44	0.12
Services	1.03	0.64-1.63	0.92
Not working	Ref		
Mother's level of education			
Primary	3.73	0.49-29.24	0.21
Junior high	4.22	0.54-33.28	0.17
Senior high	5.16	0.65-40.83	0.12
Academy (Diploma)	3.49	0.42-29.21	0.25
University	4.05	0.50-33.11	0.19
No education	Ref		
Father's level of education			
Primary	Ref		
Junior high	1.03	0.72-1.46	0.88
Senior high	0.89	0.63-1.25	0.50
Academy	1.28	0.65-2.50	0.47
University	1.20	0.75-1.90	0.45

*AOR=Adjusted Odds Ratio; **statistically significant at p<0.05; Ref= reference group

mothers who use internet almost every day were at the richer and richest wealth index category. This enables them to increase their knowledge from internet and implementing information by buying diverse food for their children.

From our knowledge, this is the first study on MDD using 6-11-month-old children population in Indonesia. In this study, we were using national scale survey data that could represent the population. The questionnaire used and asked in IDHS were using DHS Phase 7 that is used internationally. This study also adopted the most recent MDD criteria recommended by WHO. The MDD criteria was changed from four out of seven food groups to five out of eight groups by adding breastmilk into the food groups.

However, there were several limitations on our study. Based on how the primary data was obtained, there were no clear minimum amount of consumed food/drink that will be counted as consuming because the questionnaire was not doing 24-hours recall but only asking "Did your child eat/drink … yesterday?". There could be an overestimation because no matter how much the amount of food that was consumed, it will be counted as consuming. The available data only consisted of one day food report, therefore, this could not be portrayed as child's eating habit and nutritional intake. The sub-variables that used to represent independent variable from this study might be limited due to the availability of data. In the future, research using other age group and new standard in counting MDD that use minimum 10 grams consumption to be counted as consuming certain food groups should be conducted to find more comprehensive MDD achievement.

CONCLUSION

In conclusion, only one third of children age 6-11 months in Indonesia received MDD, while factors that associated with MDD in 6-11-month-old children were wealth index and frequency of using internet among mothers. This is signifying access to information on how the food should be given to child and income are essential predictors. Therefore, to improve MDD, developing program such as price control and even distribution of food in all

areas in Indonesia by government could be developed to increase the food access and availability for every household in all wealth index quintiles, especially on animal-source food. Furthermore, with the rapid grows of internet penetration among Indonesian, the government should consider channeling the information through internet that empowers women especially mothers to give diverse diet for their child.

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