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RISK FACTORS CLUSTERING OF MALNUTRITION CASE BASED ON THE UTILIZATION OF TODDLER HEALTH SERVICE AT LAMONGAN REGENCY IN 2016

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ABSTRACT

Background: Nutrition is still a major problem in Indonesia. Various efforts had been made by the government to reduce the number of children which affected by malnutrition, especially in the field of toddler health services. Based on the PSG's results in 2014-2016, the percentage of malnutrition status in East Java for infants aged 0-59 months in 2014 was 29%.

Material and Methods: The study purpose was to analyze the pattern of regional and characteristics grouping based on malnutrition risk factors, especially on the utilization factor of public health service in Lamongan Regency in 2016. This study used secondary data from Lamongan District Health Office Profile Data in 2016. The data ware analyzed by using K-Means Clustering method to know the pattern of regional grouping in Lamongan regency. The variables in this research were: percentage of toddler health service, percentage of active integrated service post, complete basic immunization coverage, and coverage of toddler who get vitamin A capsule twice a year.

Rresults: From the results of clustering analysis, it obtained 3 clusters grouping area in Lamongan regency. Characteristics of 3 clusters that are formed include: cluster 1 there are 7 districts with the overall utilization level of health services is still very low. Cluster 2 there are 3 districts showing the utilization of health service under five is still low and cluster 3 there are 17 districts with low immunization coverage

Conclusion: Each cluster had the characteristics of different risk factors on the malnutrition cases. Promotional and prevention efforts are needed, especially by health workers, on factors that affect the malnutrition cases in Lamongan regency so it is expected to suppress the malnutrition cases.

Keywords**:** *k-means clustering, risk factors, malnutrition, toddler health services*

1.0 Introduction

Malnutrition is still a major problem in Indonesia. The cause of the problem was also very complex and the causal factors could not be equated between an area with another region, between a population group with other population groups, as well as between a sub-district and other sub-districts. Various efforts had been made by the government to overcome and suppress the malnutrition cases. In the National Medium-Term Plan (NMTP) of health in 2015-2019, the main target of the sub-sector community health and nutrition development had been set. It aimed to improve the nutritional status of the community, one of which reduces the underweight prevalence in toddler (Bappenas, 2014).

Riskesdas data presented the national underweight prevalence in 2013 was 19.6%, which consisted of 5.7% malnutrition and 13.9% less nutrition. When compared with the national prevalence rate in 2010 to 17.9%, then in 2013 there was an increase in prevalence of 1.7% (Riskesdas, 2013).

Based on the PSG's results in 2014-2016, the percentage of malnutrition status in East Java age 0-59 months in 2014 was 29%. The number decreased in 2015 by 27% and in 2016 also decreased by 26.1% (Kemenkes RI, 2017).

Based on the Lamongan District Health Office's profile in 2016, the number of toddler was 73,655 toddlers consisting of 36,741 male toddlers and 36,924 female toddlers. Toddlers which weighing under the red line were as much as 381 (0.5%) of the total toddler weighed. The number of malnutrition toddler in Lamongan district was reported as many as 120 toddlers, consisting of 58 men and 62 women. If it compared with the year 2015 with the malnutritioned toddlers number as many as 147 toddlers, it could be seen as a significant decline. To reduce the prevalence of malnutrition, the local government of Lamongan District had set a target that if malnutrition cases were found, all malnutrition toddlers must be treated for improved nutritional status (Dinkes, 2016).

One of the obstacles faced, among others, coverage of toddlers who were found and referred were still low. The treatment period length was also an obstacle because usually families with malnutrition toddler had the poor prehistoric background, resulting in incomplete care and generally due to forced home (Dinkes, 2015).

Some of the toddler health services that had been done by the government include providing health services for toddlers at public health services, integrated post services, immunization programs, and vitamin A administration every February and August or twice a year. The purpose of this program was to monitor the growth of infants and reduce the malnutrition case in toddlers by recognizing the initial symptoms of malnutrition cases. If we found toddlers with malnutrition potential, then quickly can be handled and treated in public service centers that had been appointed by the local government.

The purpose of this study was to analyze the pattern of subdistrict grouping based on malnutrition risk factors, especially on the utilization factor of public health service in Lamongan regency in 2016.

2.0 Material and Methods

Data used in this research was a secondary data from Lamongan District Health Service Profile Data of 2016. Variables in this research were: percentage of health services of a toddler, active integrated service post percentage, complete basic immunization coverage, and coverage of toddler received vitamin A capsule twice a year.

The steps in this research were:

1. Descriptive statistical analysis
2. Assumptions test
   In the cluster analysis, there were two assumptions that must be found, that were:
   a. Sample adequacy test
      Kaiser-Meyer-Olkin value (KMO) was required to know the adequacy of the sample. If the KMO value was less than 0.5, then it indicated that the sample was not sufficient. If the KMO score exceeds 0.5, then the sample was considered sufficient for study.
   b. No multicollinearity occurs
      Variance Inflation Factor (VIF) was used to determine the presence of multicollinearity. If the VIF value was less than 10.00, then it did not mean multicollinearity to the data being tested. If the VIF value was greater than 10.00, then there was multicollinearity to the data being tested.
3. Conducting district grouping in Lamongan Regency by using Cluster Analysis. The clustering method used was K-Means Cluster.
   K-Means Cluster algorithm is composed of the following steps:
   a. Place K points in the space represented by the objects that are being clustered. These points represent initial group centroids.
   b. Assign each object to the group that has the closest centroid.
   c. When all objects have been assigned, recalculate the positions of the K centroids.
   d. Repeat Steps 2 and 3 until the centroids no longer move. This produces a separation of the objects into groups from which the metric to be minimized can be calculated.
4. Conducting an analysis of the characteristics of the district based on the mapping results.
   To determine the characteristics of each cluster we must analyze the variables separately for each cluster. Compare the centroid value with the mean value of the variable for each cluster and then decide which variable has a higher value in which cluster. Centroid that has a higher average has better cluster quality

The data used in this study has been through an evaluation and validation of data conducted by Lamongan district health office.

3.0 Results

The research was conducted at Lamongan District Health Office, East Java Province. In 2016, the population in Lamongan regency was 1,188,193 people with a population density of 655 people per km^2.

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3.1 Descriptive Statistics Minimum, Maximum, Means, and Standard Deviation Value of Malnutrition Risk Factors in the Field of Health Benefit of Under-fives in Lamongan District 2016

Table 1. Minimum, Maximum, Average and Standard Deviations of Malnutrition Risk Factors

Variable	Min.	Max.	Means	Std. Dev.
Toddler Health Services	5.6	21.00	12.61	3.9
Integrated Service Post	27.27	100	76.28	20.13
Immunization	83.25	135.41	107.53	11.86
Vitamin A	88.89	100	97.73	3.33

Source: Profile of Lamongan District Health Office

Table 1 showed descriptive statistics of malnutrition risk factors in Lamongan regency in 2016. Variables with the highest level of variation were found in Active integrated service post variables. The high variation was because there were four districts that had a percentage of active integrated service post of 100 percent, that was Lamongan, Brondong, Kembangbahu, and Sekaran districts. Furthermore, the lowest level of variation was found in the variable coverage of Vitamin A in toddler and the variables of toddler health services

3.2 Assumption test

a. Sample adequacy test
   The results showed that the value of KMO was 0.528 so it could be concluded that the sample was enough to be studied.
b. There was no multicollinearity among variables

Table 2. Variable Multicollinearity Test

Variable	VIF
Toddler Health Services	1.045
Integrated Service Post	1.026
Immunization	1.051
Vitamin A	1.037

Based on table 2, the VIF value of toddler health service, active integrated service post, complete immunization, and vitamin A supplementation coverage in children less than 10.00 so it could be concluded that there was no multicollinearity.

3.3 K-Means Cluster Analysis

The K-Means cluster analysis was a nonhierarchy cluster analysis, which this method started by first determining the clusters desired number. In this study, the number of clusters was 3.

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After that, an analysis was done by K-Means Cluster method and obtained the centroid value of each cluster on each variable. Table 3 showed the centroid values for each cluster in each variable.

Table 3. Cluster Center Value Analysis Results

Variable	*Cluster*		
	1	**2**	**3**
Toddler Health Services	12.91	11.67	12.66
Integrated Service Post	47.19	84.06	86.88
Immunization	105.22	130.87	104.36
Vitamin A	95.57	99.78	98.26

From the analysis result, it obtained the grouping pattern of malnutrition risk factor based on the utilization of toddler health service from 27 districts in Lamongan Regency. Here was the result of the subdistrict grouping pattern in Lamongan.

Table 4. Cluster Member Analysis Results

Cluster		
1 **n=7**	**2** **n=3**	**3** **n= 17**
Sukorame, Sambeng Pucuk, Sukodadi, Sarirejo Laren, Solokuro	Karanggeneng, Sekaran Maduran	Bluluk, Ngimbang, Mantup Kembangbahu, Sugio,Modo Kedungpring, Babat, Brondong Lamongan, Tikung, Deket Glagah, Karangbinangun Turi, Kalitengah, Paciran

Table 5. Mean Cluster and Standard Deviation Result of K-Mean Analysis

Variable	*Cluster*		
	1	**2**	**3**
Toddler Health Services	12.91 ± 4.76	11.67 ± 5.77	12.66 ± 3.57
Integrated Service Post	47.19 ± 12.03	84.06 ± 13.84	86.88 ± 8.87
Immunization	105.22 ± 10.92	130.87 ± 4.51	104.36± 8.13
Vitamin A	95.57 ± 4.56	99.78 ± 0.21	98.26 ± 2.66

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4.0 Discussion

After analyzing K-Means Clustering, it would took the subdistrict grouping result of malnutrition risk factor based on the utilization of toddler health services in Lamongan Regency. When considered in Table 3 and Table 5, the value of the cluster center in each variable was the average number of each variable in each cluster so that by comparing the average number of clusters and the average number of regencies could be obtained by the characteristics of each cluster:

- ***Cluster* 1**
  There were 7 districts, namely: Sukorame, Sambeng, Pucuk, Sukodadi, Sarirejo, Laren, and Solokuro with regional characteristics: lack of active integrated service post, low coverage of vitamin A, and low immunization coverage. It could be seen from the average value for the three variables that below the average number of \each variable districts. Compared with other clusters, this cluster had the most severe malnutrition risk factors. Where it could be concluded that people in cluster 1 were still less utilize the existing health service facilities.

- ***Cluster* 2**
  There were 3 districts, namely: Karanggeneng, Sekaran, and Maduran. With the characteristic of utilization lack of toddler health services, this could be known from the average value for this variable was still below the average number of districts.

- ***Cluster* 3**
  There were 17 districts, namely: Bluluk, Ngimbang, Mantup, Kembangbahu, Sugio, Kedungpring, Modo, Babat, Lamongan, Tikung, Deket, Glagah, Karangbinangun, Turi, Kalitengah, Paciran, and Brondong. Characteristics of this cluster included low immunization coverage because the average value was still below the district average.

The results of clustering could be seen from the utilization of toddler health services on each cluster that had different risk factors. This was in line with Ma'ruf's research (2016) that knowledge of of toddler health facilities was related to the malnutrition cases. Integrated service post and toddler health services at public health service were very useful to control the toddler development. The more frequent toddler visits to integrated service post would make the more observed the nutritional status development of children. In line with the research of Kalsum (2015) that with the existence of toddlers health facilities, then if the cause malnutrition was found, it could be done soon by malnutrition treatment with inpatient approach, either in public health center, hospital, or outpatient at health center, and post nutrition recovery based community.

For complete basic immunization, there were 2 clusters that had complete basic immunization risk factors still below the district average. In line with Whinnie's study (2009), the effect of

complete basic immunization is commonly used to see the effects of long-term nutritional disorders in the form of high growth disorders of the body. The toddler body with an incomplete basic immunization status was risked of being very short and affecting nutritional status. The underweight proportion or very underweight children were more common in toddler with underlying incomplete immunization status.

Government programs with simultaneous administration of vitamin A in infants and toddlers twice per year was aimed to improve immunity of babies and toddlers. The lower consumption of vitamin A would make the immunity level getting lower. The lower absorption of nutrients affected the nutrients absorption, thus increasing the risk of malnutrition. By consuming vitamin A, the body's immune system was getting stronger and reducing infectious diseases that resulted in malnutrition cases (Fitriyah, 2013).

By knowing the problems in each cluster, it was expected that local government could use it to formulate policies that related to the suppression of malnutrition case incident so that the intervention was done on target, according to the characteristic condition of each sub-district.

5.0 Conclusion and Recommendation

Cases of malnutrition in Lamongan District, from 2013 to 2016, were decreased. In 2016, 120 cases of malnutrition were still found, consisting of 58 men and 62 women. To reduce the occurrence of malnutrition cases, the government had made various efforts. One of them was by improving the toddler health services in health centers and integrated service post.

From the analysis results using K-Means Clustering method, malnutrition risk factors based on the utilization of toddlers health services could be grouped into 3 groups with different characteristics.

12
The results of this study were expected to be used to assist local governments in suppressing the occurrence of malnutrition cases, especially in terms of toddler health services utilization so that the intervention forms was also in accordance with the region characteristics.

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Declaration

Author(s) declare that all works are original and this manuscript has not been published in any other journals. There was no financial support of any organization for this work.

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PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9