



STOOL EXAMINATION PROFILES IN MALNOURISHED CHILDREN

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ABSTRACT

Background: Stool examination is a gold standard that can be used to detect problems in the digestive systems, which becomes a preliminary examination to determine a diagnosis. The variation characteristics of stool in malnourished children are very possible due to the infection in the digestive tract, resulting in impaired absorption of nutrients and other health problems. **Objective:** To find out the profile of routine feces examination in malnourished children. **Methods:** This study was descriptive research with a cross-sectional method. This study was conducted from April—August 2021 with a sample size of 38 stunted and malnourished children of 6 month-old to 5-year-old in Rumah Gizi and Poli Anak RSUP Dr. Kariadi Semarang. Collecting the data of anthropometric, quisioners, and laboratorium stool macroscopic and microscopic analytic. **Results:** Macroscopic examination showed that 13 samples (34.25) had a normal brown color, 35 samples (92.1%) had a soft consistency. Moreover, mucus was found in 6 samples (15.8%). In microscopic examination found that 4 cases (10.5%) were positive for carbohydrates. In 17 cases (44.75), fibers were found. Leukocytes were found in 2 cases (5.2%), erythrocytes were found in 8 cases (21.1%), occult blood was found in 10 cases (26.3%), and fungal positive was found in 14 cases (36.8%). **Conclusion:** Most of the feces were brown, had soft consistency, did not have mucus and blood. Furthermore, fat, fiber, carbohydrates, leukocytes, erythrocytes, occult bold, and fungal were not found in most of the stools.

Keywords: Stool, malnourished children, stunting, malnutrition.

INTRODUCTION

Nutritional problems or mostly called as malnutrition is a serious global problem. Nutritional problems (malnutrition) are divided into categories of undernutrition and overnutrition. The category of malnutrition which has the largest incidence rate in global prevalence, even in Indonesia is the incidence of stunting and malnutrition.¹ In the regional level, more than 50% or around 54% of stunting children are in Asia, while children with wasting reach 64% of the total data.² Furthermore, the prevalence rate in Indonesia according to Riskesdas 2018 data was 30.8% for the incidence of very short and short toddlers while 10.2% for the incidence of very thin and thin toddlers.³

The causes of malnutrition in toddlers are divided into two groups that are direct and indirect causes which are interrelated with each other.⁴ Direct causes include daily food consumption, history of exclusive breastfeeding, history of birth weight and history of infectious diseases.⁵ Meanwhile, indirect causes can be caused by parental education factors and socio-economic factors.⁶

Characteristics of feces in malnourished children vary. Certain characteristics mostly can predict the causative agent of infection resulting in

malnutrition; especially, in malnutrition caused by impaired absorption of one or more nutrients. It can be caused by various things, one of which is intestinal inflammation that lead to weight loss and impaired growth and development in toddlers/children. However, in order to determine the causative agent, laboratory tests still need to be conducted. One of them is by routine stool test which is a gold standard test of gastrointestinal problems caused by infection.⁷

Thus, the authors are interested in conducting research on the profile of children with malnutrition at the Nutrition Center of the Semarang City Health Office and the Child Development Polyclinic, Dr. Kariadi Hospital, Semarang.

METHOD

This study used a descriptive research design in order to find out how the macroscopic and microscopic examination profiles of malnourished children in the category of stunting and malnutrition aged 6-59 months. The data obtained were primary data taken directly from the respondents.

The populations of this study were children aged 6-59 months with malnutrition category who were patients at the Nutrition Center of the Semarang City Health Office and the Growth and



Development Poly of Dr Kariadi Hospital Semarang in the period April-August 2021.

This study used sample data of 38 children who had signed and agreed to the Informed Consent sheet, anthropometric index data measurements conducted were that TB/U or PB/U with Z-score limit parameter < -2 Standard Deviation for stunting nutritional status. Meanwhile, the parameter used to determine poor nutritional status was the ratio of BB/TB with Z-score < -3 Standard Deviation. Furthermore, interviews and filling out questionnaires were conducted for history of exclusive breastfeeding, history of birth weight, history of infectious diseases, parental education level, and socio-economic level. The data regards to daily food intake was conducted by filling out a food recall form 3x24 hours that was then entered into a data processing application which is called as Nutrisurvey.

The stool samples were collected for laboratory analysis for macroscopic and microscopic examinations. All data were inputted and processed into SPSS software to be analyzed.

RESULTS

From the result of the study, it shows that a total of 38 respondents which come from the Nutrition Center of the Semarang City Health Office and the Growth and Development Poly of Dr. RSUP. Kariadi Semarang. The characteristics of patients based on gender and age can be seen in table 1.

Table 1. Characteristics of Samples Based on Gender and Age

| Characteristics | N | (%) |
|---------------------|----|------|
| Child Gender | | |
| Male | 23 | 60,5 |
| Female | 15 | 39,5 |
| Age | | |
| 6-12 months | 6 | 15,8 |
| >1-3 years | 28 | 73,7 |
| >3-5 years | 4 | 10,5 |

The characteristics of the most respondents are male with the most age range of 1-3 years old as shown in table 1.

Table 2. The Distribution of Samples Based on History of Exclusive Breastfeeding

| Characteristics | N | (%) |
|--------------------------------|----|------|
| Exclusive Breastfeeding | | |
| No | 13 | 34,2 |
| Yes | 25 | 65,8 |

A total of 25 respondents are known to have characteristics with a history or are still given exclusive breastfeeding.

Table 3. The Distribution of Samples Based on Birth Weight

| Characteristics | N | (%) |
|------------------------------|----|------|
| Birth Weight | | |
| Normal | 22 | 57,9 |
| Low Birth Weight (LBW) | 13 | 34,2 |
| Very Low Birth Weight (VLBW) | 3 | 7,9 |

The characteristics of the most respondents, as many as 22 respondents (57.9%) are known to be born with normal weight as shown in table 3.

Table 4. The Distribution of Samples Based on History of Infectious Diseases

| Characteristics | N | (%) |
|---------------------------------------|----|------|
| Disease history within 1 month | | |
| Diare | 3 | 7,9 |
| acute respiratory infection (ARI) | 11 | 28,9 |
| ARI and diarrhea | 1 | 2,6 |
| TB | 2 | 5,3 |
| Other | 3 | 7,9 |
| Not any | 18 | 47,4 |

The characteristics of 18 respondents (47.4%) do not have a history of infectious disease in the last 1 month. Meanwhile, total of 11 respondents (28.9%) have a history of ARI and 3 respondents (7.9%) have a history of diarrheal disease.



Table 5. The distribution of Samples Based on Parental Characteristics

| Characteristics | N | (%) |
|------------------------------|----|------|
| Mother's Age | | |
| <20 years | 1 | 2,6 |
| 20-30 years | 17 | 44,7 |
| 31-40 years | 16 | 42,1 |
| >40 years | 4 | 10,5 |
| Father's Age | | |
| 20-30 years | 12 | 31,6 |
| 31-40 years | 20 | 52,6 |
| >40 years | 6 | 15,8 |
| Mother's Education | | |
| Middle school and equivalent | 10 | 26,3 |
| High school and equivalent | 19 | 50,0 |
| D3/S1 | 9 | 23,7 |
| Father's Education | | |
| Elementary School | 1 | 2,6 |
| Middle school and equivalent | 4 | 10,5 |
| High school and equivalent | 21 | 55,3 |
| D3/S1 | 12 | 31,6 |
| Mother's Occupation | | |
| Housewife | 32 | 84,2 |
| Employee* | 5 | 13,2 |
| Entrepreneur ** | 1 | 2,6 |
| Father's Occupation | | |
| Laborer | 4 | 10,5 |
| Employee * | 22 | 57,9 |
| Entrepreneur ** | 9 | 23,7 |
| Others*** | 3 | 7,9 |

A total of 17 respondents are children of mothers in the age group of 21-30 years where the majorities have a high school education background and equivalent and they are housewives in the family. Meanwhile, the majority of respondent's fathers are in the age group of 31-40 years with the last educational background of high school and equivalent of which 22 fathers from the sample work as employees.

Table 6. The Distribution of Samples Based on Nutritional Status

| Characteristics | N | (%) |
|---------------------------|----|------|
| Nutritional Status | | |
| Malnutrition | 13 | 34,2 |
| Stunting | 7 | 18,4 |
| Malnutrition and stunting | 18 | 47,4 |

The nutritional status of 38 malnourished children in the Nutrition Center of the Semarang

City Health Office and the Growth and Development Poly of Dr. RSUP Kariadi Semarang mostly 47.4% are malnourished with stunting as shown in table 6.

Table 7. Nutritional Adequacy

| Nutritional Adequacy * | N | (%) |
|------------------------|----|------|
| Macronutrients | | |
| Energy | | |
| Excessive | 7 | 18,4 |
| Enough | 2 | 5,3 |
| Less | 29 | 76,3 |
| Protein | | |
| Excessive | 27 | 71,1 |
| Enough | 1 | 2,6 |
| Less | 10 | 26,3 |
| Fat | | |
| Excessive | 15 | 39,5 |
| Less | 23 | 60,5 |
| Carbohydrate | | |
| Excessive | 6 | 15,8 |
| Less | 32 | 84,2 |



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Table 6 shows that the level of energy, fat and protein intake in toddlers is mostly in the less category. The energy intake of toddler in the less category is 29 children (76.3%). Fat intake in the less category is 23 toddlers (60.5%). Carbohydrate intake in the less category is 32 toddlers (84.2%). Meanwhile, protein intake for toddlers in the excess category is 27 respondents (71.1%) as shown in table 7.

Table 8. Macroscopic Characteristics of Feces of Malnourished Children

| Result of Investigation | N | (%) |
|-------------------------|----|-------|
| Color | | |
| Brown | 13 | 34,2 |
| Greenish-brown | 1 | 2,6 |
| Yellowish-brown | 4 | 10,5 |
| Reddish brown | 2 | 5,3 |
| Dark brown | 1 | 2,6 |
| Yellow | 11 | 28,9 |
| Grayish yellow | 1 | 2,6 |
| Brownish-yellow | 2 | 5,3 |
| Whitish yellow | 1 | 2,6 |
| Light yellow | 1 | 2,6 |
| Dark yellow | 1 | 2,6 |
| Consistency | | |
| Semi solid | 2 | 5,3 |
| Liquid | 1 | 2,6 |
| Mushy | 35 | 92,1 |
| Mucus | | |
| Negative | 32 | 84,2 |
| Positive | 6 | 15,8 |
| Blood | | |
| Negatif | 38 | 100,0 |

Based on table 8 above, it is found that the characteristics of the respondents' feces are mostly mushy and brown with some yellow. In more than 80% or around 32 respondents no mucus is found; besides, from all samples examined there is no macroscopic blood.

Table 9. Microscopic Characteristics of Feces of Malnourished Children

| Result of Investigation | N | (%) |
|-------------------------|----|------|
| Fat | | |
| Negative | 28 | 73,7 |
| 1 Globule/LPB | 8 | 21,1 |
| 5 Globules/LPB | 2 | 5,3 |
| Carbohydrates | | |
| Negative | 34 | 89,5 |
| Positive(+) | 3 | 7,9 |
| Positive(++) | 1 | 2,6 |

Fibers

| | | |
|----------|----|------|
| Negative | 21 | 55,3 |
| Positive | 17 | 44,7 |

Leukocytes

| | | |
|--------------|----|------|
| Negative | 30 | 78,9 |
| 0-1/LPB | 5 | 13,2 |
| 0-2/LPB | 1 | 2,6 |
| 2-5/LPB (+) | 1 | 2,6 |
| 5-10/LPB (+) | 1 | 2,6 |

Erythrocytes

| | | |
|-------------|----|------|
| Negative | 30 | 78,9 |
| 0-1/LPB (+) | 5 | 13,2 |
| 0-2/LPB (+) | 2 | 5,3 |
| 1-2/LPB (+) | 1 | 2,6 |

Occult blood

| | | |
|----------|----|------|
| Negative | 28 | 73,7 |
| Positive | 10 | 26,3 |

Fungi

| | | |
|---|----|------|
| Negative | 24 | 63,2 |
| Yeast cells found (+) | 13 | 34,2 |
| Yeast cells found & hyphae/pseudohyphae (+) | 1 | 2,6 |

In table 9, the results of the microscopic examination of respondents' feces are obtained. There is no fat which is found in the majority of the samples (73.7%). Furthermore, there are only 3 respondents (7.9%) with mild positive carbohydrates and 1 respondent (2.6%) with moderate positive carbohydrates. Most of the respondents as many as 21 children (55.4%) do not find any fiber in the stool samples. Meanwhile, in the total respondents, the majority (78.9%) do not find leukocytes or erythrocytes in the stool samples. In addition, occult blood is not found in 28 respondents (73.7%) while occult blood is found in as many as 10 respondents with feces.

DISCUSSION

The nutritional status of malnourished child respondents at the Nutrition Center and Growth and Development Poly Hospital Dr. Kariadi Mostly (47.4%) are malnourished with stunting. In this study, it is also found that most of the respondents experienced a lack of adequate macronutrients including adequacy of energy, carbohydrates, fat, and excess protein.^{8,9} This lack of energy and fat adequacy is in accordance with a study which had conducted by Dinniyyah et al, However, for protein adequacy it is not in line with this study.¹⁰

It is found that most of the samples have brown and yellow stool colors which can be



influenced by many factors in terms of the type of food intake. Generally, the normal color of feces is brown and yellow. It is derived from pigments formed from the interaction of intestinal bacteria and bile. Furthermore, research which had conducted by Steer et al show that yellow stool color is very common; especially, in the early months of life which is then dominated brown, yellow, and green color.¹¹ Stool that is left in the air can also turn darker in color due to the formation of more urobilin from the urobilinogen excreted through the intestine. Unnatural changes in the color of stools; such as, green, white putty, even red or black can be an indication of problems with the digestive tract.

Based on the results of the examination, it is found that 92.1% of the samples have a non-hard consistency. The reference criterion for normal stool is mushy but still shaped since in normal feces there is water content of 75%. In addition, changes in stool consistency can be caused by the long transit time and absorption of water in the large intestine. Stool consistency can determine the etiology of digestive problems, it should be investigated whether there is blood or mucus.

Based on the results of the macroscopic examination, there is no mucus on 32 respondents (84.2%). The existence of mucus in the stool can be an indication of prolonged irritation of the intestinal mucosa.

Meanwhile, based on the results of the macroscopic examination, on 100% respondents no blood was found. Blood in the stool can be an indication of infection from parasites or bacteria or inflammation of the lower digestive tract. The characteristics of the blood found can determine the localization of bleeding. The presence of blood and mucus is likely due to digestive tract problems caused by amoeba or bacteria.

Based on microscopic examination, there is no sample which is found that more than 60 fat globules/LPB. If it is found a value of more than 60 globules / LPB, it indicates a malabsorption in the digestive tract which can be caused by the intestines that is not absorbing food, lack of enzyme production by the pancreas, or a lack of bile produced by the liver to break down fat. Usually quite a lot of fat is found in cases of cystic fibrosis, Crohn's disease, malnutrition, disorders of the pancreas, etc.¹² Furthermore, it is only 5 respondents (10.5%) which is found carbohydrates

in the stool samples that can indicate malabsorption of unfermented carbohydrates. Based on the results of the examination of 17 respondents (44.7%), it is found excess fibers in the feces. Meanwhile, carbohydrates and fiber function in helping the expulsion of feces.¹³ Moreover, fiber has a role in binding water in the large intestine. Therefore, it makes the stool volume larger and it will stimulate the nerves in the rectum so that later it will cause the desire to defecate and shorten the transit time of feces in the intestine. The absorption of carbohydrates and fats which are not good can lead to low stool pH levels. It is related to SCFA levels in feces.

Based on the results of microscopic blood examination, it was found that in the feces of most respondents or 30 respondents (78.9%) there are no leukocytes while 8 respondents (21.1%) have leukocytes in their feces. Based on the examination in this study, the highest number of leukocytes is found in toddlers that is 0-1/LPB. Under normal circumstances, leukocytes can be found (\leq 0-3/LPB). However, there will be an increase in the number of leukocytes for cases of infection; such as, bacillary dysentery, ulcerative colitis, and inflammation. It is in accordance with a study by S Tuti where out of 8 malnourished respondents, there are 6 respondents who have a significant increase in leukocytes from the normal threshold.¹⁴

The finding of erythrocytes and occult blood in the stool culture indicates a pathological condition where the finding of erythrocytes in the stool always indicates an abnormality. Furthermore, erythrocytes are visible in the stool only if there are lesions in the colon, rectum, and anus. Under normal circumstances, the body loses 0.5-2 ml of blood per day. The amount of blood which is too small that is not visible or does not change the appearance of feces, it can be chemically known to be an early sign to suspected ulcers, cancer and other disorders of the gastrointestinal tract. Moreover, in abnormal conditions with a positive occult blood test (+) the body loses blood $>$ 2 ml / day which can be caused by both irritation and serious cancer. In this study, 21.1% of stool samples are found with erythrocyte findings and as many as 26.3% have occult blood findings. It is different from the previous study which had conducted by S Tuti and Fitrianiingsih where in both studies obtained 100% of cases with findings of erythrocytes in feces.¹⁵



Based on microscopic examination, 11 samples (36.8%) of positive respondents is found yeast cells in the feces which can be a sign of excessive growth in the gastrointestinal tract caused by decreased body immunity. It means that the examination of fungal parasites in the feces of respondents at the Nutrition Center and Dr. RSUP. Kariadi is mostly still in normal condition. In addition, under normal conditions bacteria and fungi can be found in relatively small numbers. However, if there is gastrointestinal disturbance, the number of fungi and bacteria can increase significantly so that yeast cells and hyphae can be found in the feces; for example, in the case of candidiasis. In order to be able to distinguish normal candida from candidiasis, apart from the symptoms of candidiasis, the results of the examination shows pseudohyphae forms which are invasive forms of candida in stool sample preparations.

CONCLUSION

Based on the results of this study, it shows that the incidence of stunting and malnutrition occurred mostly in male children and at the age of toddlers; especially, under three years old. On average, respondents experience a lack of energy needs and adequate macronutrient carbohydrates and fats, yet they experience excess protein. Furthermore, on macroscopic examination, most of the stool samples are characterized by brown color, mushy consistency, and there is no mucus and blood found which is found. Meanwhile, on characteristic microscopic examination of most of the samples, there is no fat, carbohydrates, fiber, leukocytes, erythrocytes, occult blood, and fungi which is found.

REFERENCES

1. Kementian Kesehatan RI. Hasil Utama Riset Kesehata Dasar (Riskesdas) [Internet]. 2018 [cited 2021 Mar 17]. Available from: <http://arxiv.org/abs/1011.1669%0A>
2. UNICEF, WHO, World Bank. Levels and trends in child malnutrition: Key findings of the 2020 Edition of the Joint Child Malnutrition Estimates. Geneva: WHO. 2020;24(2):1–16.
3. Badan Penelitian dan Pengembangan Kesehatan. Laporan Nasional Riskesdas 2018 [Internet]. Badan Penelitian dan Pengembangan Kesehatan. 2018 [cited 2021 Mar 17]; p. 198. Available from: <http://labdata.litbang.kemkes.go.id/images>
4. Perdana HM, Darmawansyih D, Faradilla A. Gambaran Faktor Risiko Malnutrisi pada Anak Balita di Wilayah Kecamatan Tamalanrea Kota Makassar Tahun 2019. *Makassar: UMI Med J.* 2020;5(1):50–6.
5. Kliegman RM, Geme J St. Nelson Textbook of Pediatrics. In: Emeritus, editor. *Nelson Textbook of Pediatrics.* 21st ed. Philadelphia, PA: Elsevier; 50 2019. p. 1755--2035.
6. Kuntari T, Jamil NA, Kurniati O. Faktor Risiko Malnutrisi pada Balita. *Kesmas Natl Public Health J.* 2013. p. 5–9.
7. World Health Organization. Basic laboratory methods in medical parasitology. In: *International Journal of Surgical Pathology.* England: WHO Library Cataloguing in Publication Data; 1997.
8. Djais J. Nutrition and Metabolic in Special Condition : Practice and Future Trends [Internet]; 2018 [cited Mar 30]. 112–114 p. Available from: <https://sipeg.ui.ac.id/ng/arsipsk/20190823Cat627c1dcd0981c3a5a51ce436c0fc2834.pdf>
9. Bonotto GM, Schneider BC, Santos IS, Gigante DP, Assunção MCF. 53 Adequacy Of Energy Consumption And Macronutrients Of Children Under Six Years Of Age [Internet]; 2012 [cited 2021 Dec 13] ;30(4):513–9. Available from: <https://www.scielo.br/j/rpp/a/cFypQyntkGzgCbwsm3WVq>
10. Diniyyah SR, Nindya TS. Asupan Energi, Protein dan Lemak dengan Kejadian Gizi Kurang pada Balita Usia 24-59 Bulan di Desa Suci, Gresik. *Amerta Nutr.* 2017;1(4):341.
11. Salwan H, Kesumawati R. Pola Defekasi Bayi Usia 7-12 Bulan, Hubungannya dengan Gizi Buruk, dan Penurunan Berat Badan Serta Persepsi Ibu. *Sari Pediatr.* 2016;12(3):168.
12. Brennan D. What Is Fecal Fat? In: *Health Encyclopedia* [Internet]. 2021 [Cited in 2021 Nov 15]. Available from: <https://www.webmd.com/digestive-disorders/what-is-fecal-fat>
13. Siregar NS. Karbohidrat [Internet]. *J Ilmu Keolahragaan.* 2014 [cited 2021 Nov 15]; 13(2):38–44. Available from: <http://digilib.unimed.ac.id/1386/1/Fulltext.pdf>
14. Suparyati T. Identifikasi Parasit Usus Dan Sel Darah Pada Feses Balita Gizi Buruk Di Mulyorejo Kecamatan Tirto Kabupaten. *J Pena.* 2020;34.



15. Fitrianiingsih. Pemeriksaan Eritrosit dan Leukosit Pada Feses Balita [Internet]. 2020 [Cited 2021 Nov 15]; 4(2):85–91. Available from: Jurnal Kajen.
16. Putra. Pengaruh Konsentrasi Karbondioksida Terhadap Pembentukan Germ Tube Candida Albicans [Internet]; 2018 [Cited 2021 Dec 21];7–19. Available from: <http://repository.poltekkes-denpasar.ac.id/417/>.