Intestinal Parasite Infestation as Risk Factor of Malnutrition in under Five Year Children at Gamping Subdistrict of Sleman, Yogyakarta Province, Indonesia

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Abstract
Intestinal parasitic infestation, although the light will result in loss of nitrogen, interfere the absorption of nutrients and reduce appetite. If this occurs in children, it will increase the risk of malnutrition. Malnutrition is still a public health problem in Indonesia. This study aims to reveal the role of intestinal parasitic infestation in children under five with malnutrition and the risk factors associated with intestinal parasitic infestation in children under five at Sub district Gamping of Sleman, Yogyakarta Province of Indonesia.Subjects were 54 under five year old children in Primary Health Care (PHC) of Sub district Gamping I-II and the last three months of not treated by anthelmintic drugs. Fecal samples are used for microscopic examination of intestinal parasitic infestation. Determination of nutritional status based on examination of blood serum (biochemical) and measurement of height and body weight (anthropometric). Biochemical parameters used were total protein and hemoglobin, whereas in anthropometry using a combination of three indicators: W/A, W/H and H/A. Risk factors supporting data obtained through a questionnaire. Stool examination conducted by wet mount method and floatation concentration Faust *et al*. to examine intestinal protozoan infection and saturated NaCl floatation for intestinal nematodes investigation. Intestinal parasite infestation prevalence data, risk factors and nutritional status assessed statistically by *chi-square* analysis to determine the relationship between variables.The prevalence of nutritional status of children was 64% normal, 34% acute malnutrition, and no severe malnutrition. The prevalence of intestinal parasitic infestation were 20%, those are *Ascaris lumbriocoides* (8%), hookworms (4%) and *Entamoeba coli* (8%). There is no significant relationship between intestinal parasitic infestation and nutritional status (p> 0.05). The factors associated with intestinal parasitic infestation of an under five year old children is parent's education level, while comorbidities, home sanitation facilities, socio-economic status and access to health services is not significantly associated.
Keywords: nutritional status, intestinal parasites, anthropometric, biochemical parameters

Background

Severe malnutrition is the worst process of chronic malnutrition. Malnutrition occured in almost all of districts or cities around Indonesia, even are 110 of 440 districts/ cities have more than 30% of children with severe malnutrition (Depkes RI, 2006). This is very high category (WHO, 2009). These conditions concern, because children are the next generation of the nation.

Malnutrition will influence many organs and systems because it were often according with intake both of micronutrient and macronutrient deficiencies. Malnutrition also leads to increase the susceptibility of infection because of its interference in immunity against microorganism. Even in acute case, malnutrition could be fatal because of the disfunction of some organs signed as hypothermia, hypoglicemia or essential electrolytes deficiency. Treated acutely malnutrition but did not followed by nutrition improving, it will impact on growth further, both of physics and mental (Nency, 2005). This of course can result in loss of the next generation quality in long-term, something that is not our desire.

According to Anonymous (2005), many factors influence the malnutrition are interrelated. The direct factors affect malnutrition are inadequate nutrition and infectious diseases, while indirect factors are the availability of food at house, poor of parenting and diet, poor of sanitation, and limited access to health services. Individually, the body needs of nutrients were vary depending on several variables such as sex, age, weight and height, activity, surrounding temperature and pregnancy and also lactation.

Intestinal parasites infestation, can causing loss of nutrient, reduction the nutrient absorpsion and chronic inflammation (Hesham *et al*, 2004). This thought to contribute to the child malnutrition and worsen the condition of children suffering from malnutrition. This research aims to reveal the role of intestinal parasite infestation in nutrition status of under five year children, and to reveal the risk factors related with the parasites infestation in five year children as well. The result will inform the role of intestinal parasites infestation in child malnutrition so it can be concidered in combating child malnutrition programme escpecially in Indonesia.

Material and Method

This is non-experimental study with *cross-sectional* design was a descriptive and analytic discussion. Subjects

were under five year old children examined in primary health care (PHC) of Subdistrict Gamping, Sleman, Yogyakarta Province of Indonesia. Both of children with malnutrition and normal nutritional and did not treated by anthelmintic drugs along three months before. Sample research was toddlers suffering from malnutrition (PHC record) and healthy children.

The dependent variabel is malnutrition prevalence with both of anthropometric and biochemical parameters, while independent variable is intestinal parasites infestation. The confounding variable data were taken as proponent such as social-economic status, family sanitation facilities, and the history of chronical disease infection.

As for the prevalence of malnutrition among under five year children are malnutrition per total number of children (based on data in PHC) multiplied by 100%. Intestinal parasitic infestation is the intestinal parasites found (protozoan and nematodes) in direct and indirect stool examination. Malnutrition rate are secondary data of malnutrition sufferer recorded by PHC in Gamping then remeasured both anthropometric and biochemically. Children who visit PHC were determined their nutritional status by the method of the WHO-NCHS (1983). Based on the parameters of weight and height, the nutritional status are grouped as follows: Over nutrition + 1deviation standart (DS) up to + 2DS of the median of NCHS; Good nutrition – 1DS up to + 1DS of the median of NCHS; Moderate nutrition – 1DS up to +2DS of the median of NCHS; Malnutrition – 2DS up to -3 DS of the median of NCHS; Severe malnutrition is more than -3 DS of the median of NCHS. The determination of nutritional status also using biochemical parameters by means of an examination of haemoglobine and serum total protein level. Confounding variable supporting data was taken from the questionnaire by means of a structured interview.

The equipments used in this research were clean container labeled for stool specimen, questionnaires, scales and height measuring device, the devices for directly stool examination (wet mount) and indirectly stool examination method by mean saturated NaCl method and Faust *et al* (1972), blood sampling device, and the device for checks the total protein and albumin levels in blood. The solutions used were 10% formaldehyde as a preservative solution of stool, 5% lugol used to dye in stool examination, saturated NaCl solution for worm eggs float, ZnSO4 solution of 33% to float intestinal protozoan cysts, and alcohol 70% for desinfectant when taking blood.

The research was conducted through three stages, the first is a sampling involves taking a sample of feces and blood serum of respondence, the second is the collection of secondary data to fill out questionnaires through interviews with parents, and the last is the laboratory examination. The both of directly and indirectly stool examination were conducted by Faust *et al.* (1972) floatation method used to find the intestinal protozoan cysts and saturated NaCl solution method to find the worm eggs. Examination of the total protein and serum albumin level is done by the principle photometer with a commercial kit.

Data Analysis. The relation between prevalence of intestinal parasites infestation and nutritional status in under five year group was analyzed by using *chi-square analysis*.

Result

Research on intestinal parasitic infestation as a risk factor for malnutrition in toddlers in Gamping Subdistrict of Sleman, Yogyakarta has been done. Data were collected from primary health care (PHC) as many as 54 children, which 25 children from PHC I and 29 children from PHC II. Determination of nutritional status anthropometrically based on z-scores and the interpretation is determined from a combination of these three data A-BW, HB-A and BW-HB, with provisions as described previously. In this study, the nutritional status was classified into three categories: normal, normal with a history of malnutrition and acute malnutrition.

As the supporting data are also taken several family factors that may be related to the intestinal parasite infestation or which affect the nutritional status of children. Some of these factors include socio-economic, comorbidities, home sanitation facilities and the distance between the house-PHC. Data were collected through questionnaires. The results of the data collection are presented in Table 1.

Table 1. Respondent's Family Characteristics both in Primary Health Care of Gamping I and II Year 2012

No.	Characteristics	PHC Gamping I (n=25)	PHC Gamping II (n=29)	Total (n=54)
1	**Income**			
	< RMW	20(80 %)	18(62,07 %)	38(70,37 %)
	≥ RMW	5 (20 %)	11(37,93 %)	16(29,63 %)
2	**Education's Level**			
	Low	8 (32 %)	11(37,93 %)	19(35,19 %)
	Moderate	15(60 %)	14(48,28 %)	29(53,70 %)
	High	2(8 %)	3 (13,79 %)	5(9,26 %)
3	**Comorbidities**			
	No	8 (32 %)	5 (17,24 %)	13(24,07 %)
	Acute (ARI)	14(56 %)	20(68,97 %)	34(62,96 %)
	Chronic (TB)	3 (12 %)	4 (13,79 %)	7 (12,96 %)
4	**Home sanitation**			
	Good	24(96 %)	28(96,55 %)	52(96,30 %)
	Bad	1(4 %)	1(3,45 %)	2(3,70 %)
5	**Distance of -PHC**			
	0 - 1 km	12(24 %)	3 (10,34 %)	15(27,78 %)
	1,1-3 Km	13(52 %)	21(72,41 %)	34(62,96 %)
	> 3 Km	0(0 %)	5 (17,24 %)	5(9,26 %)

RMW: regional minimum wage

Determination of nutritional status is conduct by both of anthropometric and biochemical measurement. The results are presented in Table 2 and Table 3.

Table 2. The nutritional status of under five year of Gamping Subdistrict in 2012 based on anthropometric measurement

Primary Health Care	**n**	**Nutritional Status**		
		Normal	**Normal with malnutrition history**	**Acute malnutrition**
I	22	3 (13,64%)	13 (59,09%)	6 (27,27%)
II	28	5 (17,86%)	12 (42,86%)	11 (39,39%)
Total	50	8 **(16%)**	25 **(50%)**	17 **(34%)**

Table 3. The nutritional status of under five year of Gamping Subdistrict in 2012 based on biochemic measurement

Primary Health Care	**n**	**Nutritional Status**			
		Normal	**Anemia**	**Hypoproteinemia**	**Anemia + Hypoproteinemia**
I	22	14 (63,64%)	1 (4,55%)	5 (22,73%)	2 (9,09%)
II	28	6 (21,43%)	1 (3,57%)	14 (50,00%)	7 (25,00%)
Total	50	20 **(40,00%)**	2 **(4,00%)**	19 **(38,00%)**	9 **(18,00%)**

The prevalence of intestinal parasitic infestation was determined by microscopic examination of stool to find the worm eggs or cysts with a direct method. If the examination is not found parasites, then proceed will continue to the indirect methods. The results are presented in Table 4.

Table 4. Prevalence of intestinal parasites among under five year in Gamping Subdistrict at 2012

Intestinal Parasite	n	Primary Health Care		
		Gamping I (n=22)	Gamping II (n=28)	Total (n=50)
Nematode	22	0 (0,00%)	6 (27,27%)	6 (12%)
Protozoan	28	1 (3,57%)	3 (13,64%)	4 (8%)
Total	50	1 **(2,00%)**	9 **(18,00%)**	10 **(20%)**

Chi-square test shows that no association between parasite infestation and nutritional status (p = 0.925 for anthropometric approach and p = 0.201 for biochemical approach) and it proves that only factor maternal education was significantly related to the intestinal parasitic infestation (p = 0.013), while other factors did not show any significant relationship with *p value* respectively parental income 0.625; comorbidities 0.133; hygiene practices 0.57; -PHC distance 0.152; and sanitation facilities at house 0.539.

Discussion

The prevalence of intestinal parasitic infestation in children under five at Gamping Subdistrict by 20%, and 18% of them was intestinal worm infestation. Types of parasites found were *Ascaris lumbriocoides* (8%), hookworms (4%), and *Entamoeba coli* (8%). *Ascaris lumbricoides* infestation can affect the nutritional status of children because these worms suck the nutrition that is ready to be absorbed in the small intestine, while the hook worm can cause anemia because these worms suck blood (John and Petri 2007). *Entamoeba coli* is an intestinal protozoan that is not pathogen because of amoeba are commensal and not invasive, so it does not cause health problems (John and Petri 2007).

The survey results nutritional status of children in the District Gamping in this study was 64% children with normal nutritional, 34% children with acute malnutrition, and no poor nutritional status. The condition in the provincial level was normal 81%, malnutrition 9.9% and severe malnutrition 1.4%. It shows that Gamping is better in terms of no cases of malnutrition but lower rate in normal nutritional status.

There is no relation between intestinal parasite infestation with nutritional status in this study. It may because of a slight infection of parasites so it is not enough effect on nutritional status, but in this study no assessment quantitatively, so it is unknown the intensity of parasitic infections. According to Khalid (2010), worm infestation affects the nutritional status of children in West Nusa Tenggara (NTB). The difference may be caused by difference social situation between Yogyakarta dan NTB. The possibility of other factors that affect nutritional status include the history of infectious diseases, food intake (Fatima *et al*, 2008), and occupation of parents (Devi, 2012). Additionally, some characteristics of the family conditions data were taken into consideration. Those are parental income, maternal education, comorbidities, home sanitation, and the distance of house-PHC.

Parental income. Note that 70.37% have lower incomes than the regional minimum wage in 2012 (IDR. 892,660.00) (Disnakertrans DIY, 2012) and only 29.63% above the minimum wage. This indicates that most of the children come from poor families, however, the amount of income is not a factor associated with intestinal parasitic infestation (p = 0.625). This suggests that the lack of parental income is not related to the behavior of parents at risk for intestinal parasitic infestations.

Maternal education. It shows that 53.70% were moderate educated, 35.19% have low education and only 9.26% were high educated of maternal education. This aspect was associated with intestinal parasitic infestation (p = 0.013). This likely indicates that parental educational factors play a role in intestinal parasite infestation. According to Mubarak *et al*, (2007) the higher education a person the easier they receive information, and ultimately the more knowledge they have. Conversely, if a person's level of education is low, it will hinder of a person's behavior towards acceptance, information and new values introduced. The amount of knowledge a person will affect the way people think and how to think someone would affect a person's behavior, including health-related behaviors. Thus the higher educated parents will pay more attention to his family hygiene practices, so as to prevent the infestation of intestinal parasites in children under five.

Comorbidities. There are 62.96% children have co morbidities such as upper respiratory infections and 12.96% who have chronic infection (pulmonary tuberculosis). Statistically, there was no significant association with intestinal parasitic infestations. It can be assumed that the illness did not reduce immunity allowing the parasite infestations or otherwise, the intestinal parasitic infestation does not causing infection comorbidities. According Cauriel (2002), upper respiratory infections mostly caused by a viral infection, mild and self-limiting.

Home sanitation. There were 96.30% good and adequate home sanitation. Sanitary surveyed is a source

of clean water and proprietary WC (water closed) to defecate. Statistically, there was no significant relationship between ownership of sanitation and intestinal parasitic infestations. This may because of the home sanitation should not be used to break the transmission of intestinal parasitic infestation which is based on fecal contamination. However, this needs to be proved further.

Distance of house-PHC. It appears that most of the children lived not far from the PHC which is 90.74% within 0-3 km and only 9.26% which is more than 3 km and the farthest distance is more than 6 km. Statistically, the distance between house - PHC are not significantly associated with parasitic infestation. This may indicates that respondents' are still within the range of promote and prevent services of health center so that has no effect on the prevalence of intestinal parasitic infestation that is relatively low (12% nematodes and 8% protozoa).

Conclusion

1. There is no significant relation between intestinal parasite infestation and malnutrition of under five year child in Gamping Subdistrict, Sleman, Yogyakarta.
2. The factor associated with intestinal parasitic infestations of under five year child are parent education, while comorbidities, house sanitation facilities, socio-economic status and access to health services are not significantly associated.

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