Original Article

Determinants of child malnutrition during the 1999 economic crisis in selected poor areas of Indonesia

Saptawati Bardosono MD PhD, Soemilah Sastroamidjojo MD and Widjaja Lukito MD PhD

South East Asian Ministries of Education Organization Regional Center for Community Nutrition at the University of Indonesia, Jakarta, Indonesia

There is empirical evidence at the national level that suggests the 1999 Indonesian economic crisis impact was very heterogeneous both between urban and rural areas and across regions. A cross sectional study of the nutritional status of children and its determinants was performed in urban poor areas of Jakarta, and rural areas of Banggai in Central Sulawesi, and Alor-Rote in East Nusa Tenggara. Two-stage cluster sampling was used to obtain 1078 households with under-five children in the urban poor area of Jakarta, and 262 and 631 households with under-five children each for the rural areas of Banggai and Alor-Rote, respectively. Data collection for both studies was performed from January 1999 to June 2001. The study shows that wasting affected more children in the urban poor areas of Jakarta than in the other study areas. On the other hand, stunting and anemia were significantly more severe among children 6-59 months of age in the rural area of Alor-Rote compared to the other study areas. The high prevalence of infectious diseases was significantly related to the higher prevalence of wasting in the study areas of Jakarta and Banggai, and also significantly related to the higher prevalence of stunting and anemia in the study area of Alor-Rote. To avert this kind of health impact of a economic downturn, there is a need to improve the nutritional and health status of under-five children and their mothers through the existing health care system, provide basic health services and improve the capacity of health staff across Indonesia as part of the decentralization process.

Key Words: crisis, poverty, economy, recent-onset malnutrition (wasting), chronic malnutrition (stunting and anaemia), determinants, under-five children, Jakarta, Banggai, Alor-Rote

INTRODUCTION

The nutritional status of under-five children that can be used as a public health indicator, and, especially in developing countries, can be assessed by monitoring child growth. In situations such as monetary crisis or natural disaster, to estimate the need for intervention, nutrition surveys are necessary. Most frequently these include food intake and/or an anthropometrical survey. The importance of the nutritional status of the individual, particularly the vulnerable, such as under-five children, is that it affects physical, mental, social and intellectual growth beginning with fetal life, infancy and childhood extending to adolescence and adulthood.[1-3]

Malnutrition refers to any disturbance in macro-nutrient (energy and protein, carbohydrate, lipid or water), micro-nutrient (vitamin and mineral) or other biologically advantageous food component status in a living organism, people for our purposes; 'dysnutrition' would be a better term, since it does not pre-suppose directional change in nutrient or body compositional status. It is often part of a vicious cycle that also includes poverty and disease, especially infectious disease, but also chronic degenerative disease. The three components are inter-related and each contribute to the occurrence and persistence of the others. Malnutrition may therefore act through the other two components of the cycle and lead to further malnutrition. Socio-economic and political changes that improve health and nutrition conditions can break the cycle, as can specific interventions in the areas of nutrition, health and related sectors.[2,4-8]

Monetary crisis has affected Indonesia since 1997 combined with the long droughts of El Nino and La Nina in 1997 in the Eastern region of the country. It has grown to become a continuing economic, political and social crisis. The Asia –wide monetary crisis of 1999 was particularly catastrophic. A qualitative survey of the social impact of the crisis in every sub-district of Indonesia done one year after the crisis found several coping strategies of households to cope with the crisis, among others: working more hours, increasing the number of family members working and migration of males and females, reducing the quantity and quality of food consumption, drawing down savings, selling properties/commodities and change in the participation and contributions to ceremonial activities, delayed

Corresponding Author: Dr. Saptawati Bardosono, SEAMEO TROPMED Regional Center for Community Nutrition University of Indonesia, Jakarta, Jalan Salemba Raya No. 6, PO Box 3852, Jakarta, 10430, Indonesia
Tel/Fax: 62 21 3913932 / 3913933 / 330205
Email: tati_bardo@yahoo.com
Accepted 8 January 2007.

enrolment and drop-outs at the primary school level, reduced parental contribution to school and decreased teacher attendance, and finally a population unable to afford staple foods and cooking fuels with consequential indications of malnutrition.[9]

A macro level analysis published by BPS, 2000, showed some of the impacts of the monetary crisis on welfare indicators, such as an increase in the proportion of open unemployment among higher educational level graduates, an increasing number of those working in informal sectors, an increase of those working less hours, increasing numbers of child labor especially in urban areas, decreasing energy and protein consumptions in line with the increased ratio of food expenditure to total expenditure that resulted in increased prevalence of severe malnutrition of under-five children.

In low economic communities or poor households, which constitute the majority of the Indonesian population, the decreased purchasing power caused by the economic crisis meant individuals could not meet their basic needs including food and health care. This poverty status of households is commonly regarded as the basic root of malnutrition as it negatively affects child health and nutritional status. Poverty can lead to low levels of parental education, poor housing, poor access to water and sanitation.[5] Besides, it also leads to serious limitations in gaining access to other basic needs and social services,[10] such as to scarce resources for buying food, poor food availability, and inadequate health care. It also links to levels and patterns of household consumption expenditure, especially for health, education and food.[8] All of these contribute to a greater risk of disease and reduced energy and nutrient availabilities.[2]

Studies on the social impact of the crisis in Indonesia in terms of coping strategies, food security, employment, education and health found that the impact of the crisis across the country was very heterogeneous. The impact of the crisis on the nutritional status of under-five children has been the subject of debate among experts. It is widely acknowledged that the crisis did have some direct and indirect impact on the nutritional status of under-five children of poor households. The relationship between poverty and nutritional status has previously been investigated, and child growth and development indicators are recognized as non-economic poverty indicators. While the amount of available food energy may not have been influenced by the crisis, the composition of the diet has changed. However, national socio-economic data revealed no changes in the prevalence of malnutrition. Therefore, this study set out to determine key determinant(s) of child malnutrition during the recent crisis in selected poor areas of Indonesia and their significance. Such determinant(s) are likely to be very important in the identification and reduction of the severity of malnutrition basically caused by poverty. The main hypothesis is that children aged 6-59 months in the urban poor areas of Jakarta suffered from the recent-onset type of malnutrition (wasting) during the economic crisis and that those in the rural areas of Banggai and Alor-Rote suffer from the long-term-onset type of malnutrition (stunting and anemia), and that the key determinant(s) of malnutrition are food intake for children 6-59 months living in the urban poor areas of Jakarta during the economic crisis, but infections for those living in the rural areas of Banggai and Alor-Rote.

MATERIALS AND METHODS

Study design

This study was a cross sectional study in three selected poor areas of Indonesia. Under a cross sectional study design, this study was limited to gathering information on nutritional status and health conditions of children 6-59 months of age.

Study Site

This study was part of a collaboration project between the Relief Program of World Vision International (WVI) and the Regional Center for Community Nutrition of SEAMEO-TROPMED RCCN-UI Jakarta on a Comprehensive Health and Nutrition Baseline Survey in some regions of Indonesia during the economic crisis of 1999/2000. The study was conducted in the poor urban areas of Northern and Eastern Jakarta and the poor rural areas of Banggai (Central Sulawesi) and Alor-Rote (East Nusa Tenggara).

Study Subjects

The study population consisted of households with the youngest children aged 6-59 months living in the poor urban areas of Northern- and Eastern-part of Jakarta and the poor rural areas of Banggai (Central Sulawesi) and Alor-Rote (East Nusa Tenggara).

Sample size and Sampling procedure

A two-stage cluster sampling technique was used, because it is the most widely used and often the only feasible method in emergencies involving large population groups.[11] Due to limitations in data on the prevalence of the different types of malnutrition in each of the study areas during the crisis (stunting, underweight, wasting, undernutrition and anemia), the sample size required to study the populations was calculated using the prevalence of underweight in each study area (Jakarta 20%, Central Sulawesi 50% and East Nusa Tenggara 50%), with a relative precision of 20%, and clustering or design factor of 2 to the confidence level of 95%. The required sample size for the urban poor area of Jakarta was 769 households, for the rural area of Banggai 193, and for the rural area of Alor-Rote 386.

Data Collection

Data collection was conducted in January 1999 and was completed in June 2000. Data collection was carried-out by trained supervisors and enumerators graduated from the Academy of Nutrition and other health institutions. Hemoglobin was assessed by trained local laboratory technicians or mid wives from the Ministry of Health in Jakarta, Banggai and Alor-Rote. The following procedures were used to obtain the data:

Interview of the child's mother as respondent using structured questionnaire was used to collect general socio-demographic characteristics of the households, households' coping mechanisms, health and nutritional data through home visit.

Observation during the home visit was used to obtain information on housing and environmental sanitation conditions, the ownership of luxury goods and KMS (*Kartu Menuju Sehat*/Road to Health Card), and availability of iodized cooking salt.

Dietary assessment using the food frequency questionnaire method allowed estimates of usual intake of foods or specific classes of foods on a daily and weekly basis.

Anthropometric measurements were performed on children aged 6-59 months to obtain information on weight-for-age, height-for-age and weight-for-height indicators, and mid-upper arm circumference (MUAC) in cm. As recommended by the WHO, the height and weight reference data for population studied by the United States National Center for Health Statistics (the NCHS/WHO reference) was used in this study in the form of Z-scores (standard deviation score). The children then were classified as above -2SD (considered "normal"), between -2SD and -3SD (moderately malnourished), or below -3SD (severely malnourished). For the MUAC, a single cut-off (12.5 cm) was used to classify severe undernutrition. For the children's mothers, weight in kg and height and MUAC in cm were measured. Body mass index (BMI) was calculated as the ratio of body weight in kg to height in meter squared. For the BMI and MUAC, a single cut-off (18.5 and 23.5 cm, respectively) was used to classify poor nutritional status of the mothers. A standard anthropometrical procedure was used to assess these variables.[11,12]

Hemoglobin of the children and their mothers was assessed using a standardized hemoglobin photometer (HemoCue). It used disposable sample cuvettes into which capillary blood drawn from a pricked finger was put. The cuvette was then placed in the instrument for automatic hemoglobin measurement to have results available in 1-2 minutes.

Statistical analysis

Data entry, processing and analyses were performed using Statistical Package for Social Sciences (SPSS) for Windows version 9.0 and EPI-INFO program (version 6). Comparing the prevalence of malnutrition, and the proportion of variables studied, chi-square tests were applied to analyze data of the three study areas and data. Comparison of the means of Z-scores and other continuous variables studied, analysis of variance (ANOVA) was applied to analyze data of the three study areas. Multiple linear regression analysis was applied to analyze child malnutrition determinant(s) followed by path analyses to see the mechanism of the effect of the significant predictors/determinants resulted from the final model of multiple linear regression analysis. In all statistical analyses, a p-value of less than 0.05 was considered significant.

RESULTS AND DISCUSSION

Indonesia consists of many areas with different characteristics. This study covered 3 different areas on different islands, namely the poor urban areas of Jakarta (Eastern and Northern-part in Java island), the rural area of Peling-island in Banggai district Central of Sulawesi island, and the rural area of Alor-district and Rote-island in Kupang district East Nusa Tenggara islands (Fig 1).

Figure 1. Study areas (Jakarta, Peling-island in Central Sulawesi, and Alor and Rote islands in East-Nusa-Tenggara

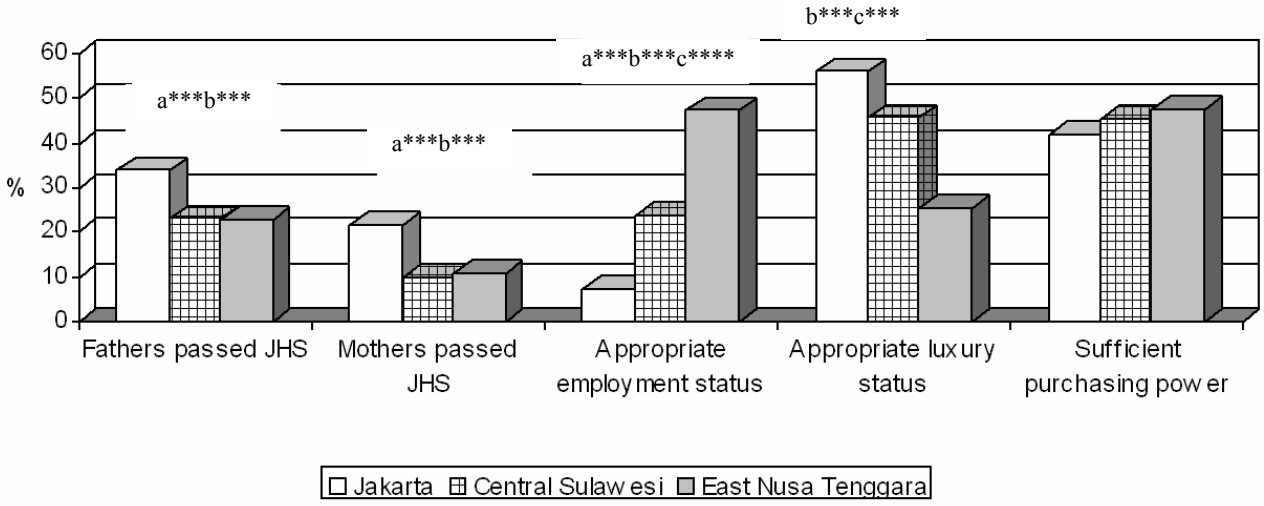


Figure 2. Households' socio-economic conditions of children 6-59 months of age in the urban poor area of Jakarta, poor rural areas of Central Sulawesi and East-Nusa-Tenggara in 1999/2000 (JHS, junior high school; a, significance difference between Jakarta and Central Sulawesi; b, significance difference between Jakarta and East-Nusa-Tenggara; c, significance difference between Central Sulawesi and East-Nusa-Tenggara; *, $p<0.05$; **, $p<0.01$; ***, $p<0.001$)

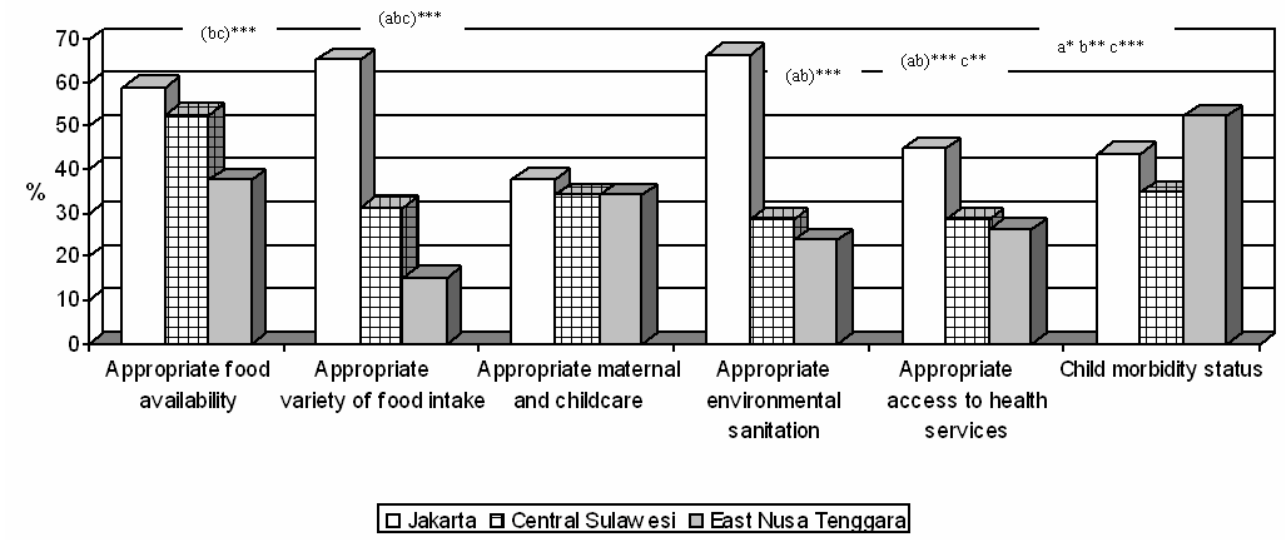


Figure 3. Factors related to nutritional conditions of children 6-59 months of age in the urban poor area of Jakarta, poor rural areas of Central Sulawesi and East-Nusa-Tenggara in 1999/2000. a, significance difference between Jakarta and Central Sulawesi; b, significance difference between Jakarta and East-Nusa-Tenggara; c, significance difference between Central Sulawesi and East-Nusa-Tenggara; *, $p<0.05$; **, $p<0.01$; ***, $p<0.001$)

Subject characteristics in the urban poor areas of Jakarta

Jakarta as a metropolitan city is characterized by its large population of almost 10 million.[13] It consists of different areas, i.e. the real urban area that has appropriate surroundings for employment, housing, food and services and also the ghettos and slums that have surroundings which are often worse than rural areas and contain pockets of poverty. Some of the people living in Jakarta are migrants from the neighboring areas of Jakarta and other provinces across Indonesia. Most of them did not have any professional skill, thus, most (78%) work as laborers or as street vendors or can be classified as having no regular income.

The majority of both male and female populations in Jakarta are literate and only 1.1% and 3.2% of them, respectively, have no schooling. Their main job type has been trading. However, there are high unemployment rates both for male and female (13.4% and 17.9%, respectively). The total expenditure per-capita per-month in Jakarta was Rp. 327,944 with 46.67% spent on food. Adequate housing conditions in Jakarta are found as almost all households have permanent walls, a permanent roof and floor materials.[13]

As indicators of health status, it was found that the infant mortality rate (IMR) per-1000 live births was 24 (national data in 1997 was 35.7 in urban area) and life expectancy rate of 71 years. The nutrition condition of the under-five children determined by the prevalence of malnutrition (in the form of low weight-for-age) was within a range of 14.56 to 20.17% (MOH, 2000) which was lower than the national data of 26% in 1998.

The survey in Jakarta covered 1078 households from 15 villages in the selected poor urban areas of Eastern and Northern Jakarta. It was revealed (Fig 2 and Fig 3) that only ≈34% of fathers had finished junior high school and

even less mothers (≈22%). More than 70% of the fathers had no regular income and only 7.4% of the sample households had both father and mother in work (or could be classified as households with adequate employment status). Based on the reported income and/or expenditure per-capita per-month, 41.7% of the sample households could be classified as having sufficient purchasing power or had income and/or expenditure per-capita per-month equal to or over the poverty line for urban areas (Rp. 96,959 in 1999). It was also found that less than 60% of the sample households could be classified as having appropriate luxury goods in terms of having their own-house (42.2%), vehicles (≈30%) and electronic goods (70%), mostly radio and television, with almost all of the sample households having access to electricity (97.5%). More than 70% of the sample households had appropriate walls, roof and floor materials, with more than 60% of the houses having only 1 bedroom. Besides appropriate housing conditions, this study also found that almost 90% of sample households had access to protected drinking water source (mostly bought water) and used appropriate latrine facilities (private/public latrine).

Based on the combined score of KMS (growth chart card) ownership, coverage of immunization and vitamin A capsule distribution, only 45% of under-five children from the sample households could be classified as having appropriate access to health services with less than 70% having KMS, less than 60% completed immunization and only 50% a vitamin A capsule during the last 6 months. Furthermore, more than 40% of under-five children were reported to suffer from an infectious disease during the past 3 days, mostly respiratory tract infections (22.4%), fever (9.8%) and diarrhea (6.2%).

Based on the scoring of combined child feeding practice (breast feeding and complementary feeding), maternal nutritional knowledge and nutritional status, appropriate maternal and childcare was found in less than 40% sample households with 13.4% and 17.6% of mothers had low BMI (less than 18.5) and low MUAC (less than 23.5 cm), respectively. For maternal nutritional knowledge, the percentage of mothers with knowledge about night-blindness was found to be the lowest (49.3%) as compared to mothers' knowledge about iodized cooking salt (65.8%) and anemia (81.8%). Only about 53% of mother breastfed their under-five children for more than 12 months, and breast milk was given exclusively for 4-6 months by 33.5% of mothers.

Furthermore, 47.0% of mothers could be classified as having appropriate food habits based on a score of meal provision that consisted of combined carbohydrate and protein-rich foods for their under-five children 3 times daily or more. The scoring of food habits combined with purchasing power conditions that reflected household food availability showed that in this study almost 60% of the sample households could be classified as having appropriate food availability. Scoring of daily intake of carbohydrate-rich, protein-rich, iron-rich and vitamin A-rich foods that reflected a variety in food intake revealed that 65.3% of under-five children in the urban poor area of Jakarta could be classified as having appropriate variety of food intake. It varied from only 40.4% with a daily intake of iron-rich foods, 46.5% a daily intake of plant protein-rich foods, 47.1% a daily intake of animal protein-rich foods, 68.3% a daily intake of total protein-rich foods, 84.9% a daily intake of vitamin A-rich foods, and 98.3% a daily intake of carbohydrate-rich foods.

Subject characteristics in the rural poor area of Banggai-Central Sulawesi

Central Sulawesi Province is an area in the Eastern-part of Indonesia that is characterized as an agricultural area with a population of almost 2 million (Biro Pusat Statistik/Center for Statistics Bureau, or BPS, 2000). The majority of both male and female populations in Central Sulawesi were literate with 3.4% and 6.8% of males and females still without schooling, respectively. The main type of job was agriculture with 86.8% of males participating in the labor force. A low percentage of unemployment rate both for males and females (3.2% and 6.4%, respectively) was found. The total expenditure per-capita per-month in Central Sulawesi was Rp. 130,660 with more than 50% (65.61%) spent on food. Inappropriate housing conditions in Central Sulawesi were reflected by only ≈65% households having a permanent roof and floor materials although ≈ 90% of households had permanent wall materials.[13]

As an indicator of health status, it was found that the infant mortality rate (IMR) was 60 per-1000 live births (national data in 1997 was 58 in rural area) with a life expectancy rate of 63 years. The nutrition condition of the under-five children determined by the prevalence of malnutrition (in the form of low weight-for-age) was in a range of 26.6 to 30.6% (MOH, 2000) which was a little bit higher than the national figure of 26% in 1998.

The survey in Central Sulawesi covered only 262 households from 12 villages in the selected poor rural area of Peling-island of Banggai district. The study area basically had minimal infrastructure and was only accessible by regular ferry service. From the survey (Fig 2 and Fig 3), it was revealed that only 23.0% of fathers had finished junior high school and only 9.7% for mothers. Some 14.5% of the fathers had no regular income and 23.9% of the sample households had both the fathers and mothers at work (or could be classified as having appropriate employment status). Based on scoring of reported family income from plantation and animal raised, 45.4% of the sample households could be classified as having sufficient food production and this was regarded as purchasing power in this study. It was also found that less than 50% of the sample households could be classified as having appropriate luxury goods in terms of having their own-cultivated land (77.7%), vehicles (≈28%) and electronic goods (33.5%), mostly radio with only 29% sample households having access to electricity. More than 60% of the sample households had appropriate wall, roof and floor materials, with almost all of the houses having more than1 bedroom. Besides housing conditions, this study also found that ≈70% of the sample households had access to protected drinking water source, but less than 50% of sample households used appropriate latrine facilities (private/public latrine).

Based on the combined scoring of KMS (growth chart card) ownership, coverage of immunization and vitamin A capsule distribution, less than 30% of under-five chil-

dren from the sample households could be classified as having appropriate access to health services with more than 80% had KMS cards, but only ≈30% had completed immunization and less than 30% took a vitamin A capsule during the last 6 months. Furthermore, ≈35% of under-five children were suffered from infectious diseases during the previous 3 days, mostly respiratory tract infections (20.6%), fever (12.2%) and diarrhea (1.5%).

Based on the scoring of combined child feeding practice (breast feeding and complementary feeding), maternal nutritional knowledge and nutritional status, appropriate maternal and childcare was found in less than 35% sample households with 18.8% and 23.4% of mothers having a low BMI (less than 18.5) and low MUAC (less than 23.5 cm), respectively. For maternal nutritional knowledge, mothers' knowledge about iodized cooking salt was found to be the lowest (43.6%) as compared to mothers' knowledge about night blindness (49.2%) and anemia (95.4%). Only approximately 52% of mother breastfed their under-five children for more than 12 months, and breast milk was given exclusively for 4-6 months by ≈25% of mothers.

Only ≈27.0% of mothers could be classified as having appropriate food habits based on the scoring of meals provided that consisted of combined carbohydrate and protein-rich foods to their under-five children 3 times daily or more. The scoring of combined food habits and food production conditions that reflected households' food availability in this study showed that almost 53% of the sample households could be classified as having appropriate food availability. Scoring of combined daily intake of carbohydrate-rich, protein-rich, iron-rich and vitamin A-rich foods that reflected food variety revealed that only 31.3% of under-five children in the rural area of Banggai could be classified as having an appropriate variety of food intake. It ranged from only 26.3% daily intake of plant protein-rich foods, 45.0% daily intake of vitamin A-rich foods, 51.1% daily intake of iron-rich foods, 84.4% daily intake of carbohydrate-rich foods, 89.3% daily intake of animal protein-rich foods, and 89.3% daily intake of total protein-rich foods.

Subject characteristics in the rural poor area of East Nusa Tenggara

East Nusa Tenggara Province is an area in the Eastern-part of Indonesia that is characterized as an agricultural area with a population of almost 4 million.[13] It is also characterized by its common long droughts and natural disasters. The majority of both male and female populations in East Nusa Tenggara were literate; however, 11.7% and 16.9% of males and females, respectively, were still without schooling. The main job type was agriculture with 87.0% of males participating in the labor force. Low unemployment rates, both for males and females (2.3% and 3.8%, respectively), were found. The total expenditure per-capita per-month in East Nusa Tenggara was as low as Rp. 90,991 with more than 50% (70.30%) spent on food. Inappropriate housing conditions in East Nusa Tenggara were reflected in only 40% or less households with permanent walls, roof and floor materials.[13]

As an indicator of health status, it was found that the infant mortality rate (IMR) was 56 per-1000 live births (national data in 1997 was 58 in rural area) with life expectancy rate of 64 years. The nutrition condition of the under-five children, determined by the prevalence of malnutrition (in the form of low weight-for-age), was in the range of 23.4 to 46.01% (14) which was much higher than the national figure of 26% in 1998.

The survey in East Nusa Tenggara covered 631 households from 21 villages in the selected poor rural area of Alor district and Rote-island of Kupang district. The study area was accessible by regular ferry and ship services. Access by airplane was uncertain depending on the weather. From the survey, it was revealed (Fig 2 and Fig 3) that only ≈23.0% of fathers had finished junior high school and only 10.9% for mothers. About 21% of the fathers had no regular income and in 47.3% of the sample households both the father and mother worked regularly (or could be classified as having appropriate employment status). Based on the reported family income from plantation and animals raised, 47.7% of sample households could be classified as having sufficient food production and that was regarded as purchasing power in this study. It was also found that only ≈26% of the sample households had 'luxury' goods in terms of having their own-cultivated land (62.8%), vehicles (≈12%) and electronic goods (24.4%), mostly a radio with only 31.4% sample households having access to electricity. About 32% of sample households had appropriate wall, roof and floor materials, with ≈90% of the houses having more than 1 bedroom. Besides housing conditions, this study also found that ≈65% of sample households had access to a protected drinking water source and ≈60% of the sample households used appropriate latrine facilities (private/public latrine).

Based on the combined scoring of KMS (growth chart card) ownership, coverage of immunization and vitamin A capsule distribution, less than 30% of under-five children from the sample households could be classified as having appropriate access to health services, with only 27.1% having KMS cards, and only 22.0% completed immunization, but more than 60% had had a vitamin A capsule during the last 6 months. More than 50% of under-five children were reported to have had an infectious disease during the previous 3 days, mostly respiratory tract infections (26.0%), fever (22.0%) and diarrhea (3.0%).

Based on the scoring of combined child feeding practice (breast feeding and complementary feeding), maternal nutritional knowledge and nutritional status, appropriate maternal and childcare was found in less than 35% of sample households with 32.7% and 49.6% of mothers found to have low BMI (less than 18.5) and low MUAC (less than 23.5 cm), respectively. For maternal nutritional knowledge, the percentage of mothers who knew about iodized cooking-salt was found to be the lowest (4.6%) as to night blindness (40.2%) and anemia (62.7%). Approximately 68% of the mothers breastfed their under-five children for more than 12 months, and breast milk was given exclusively for 4-6 months by ≈30% of mothers.

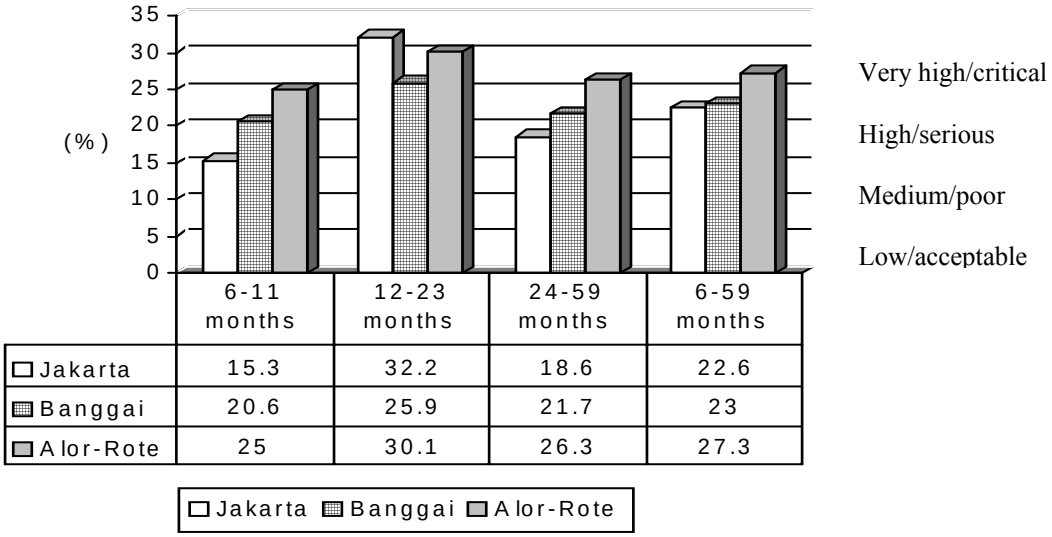


Figure 4. Prevalence of wasting (WHZ less than -2SD) of children 6-59 months by age

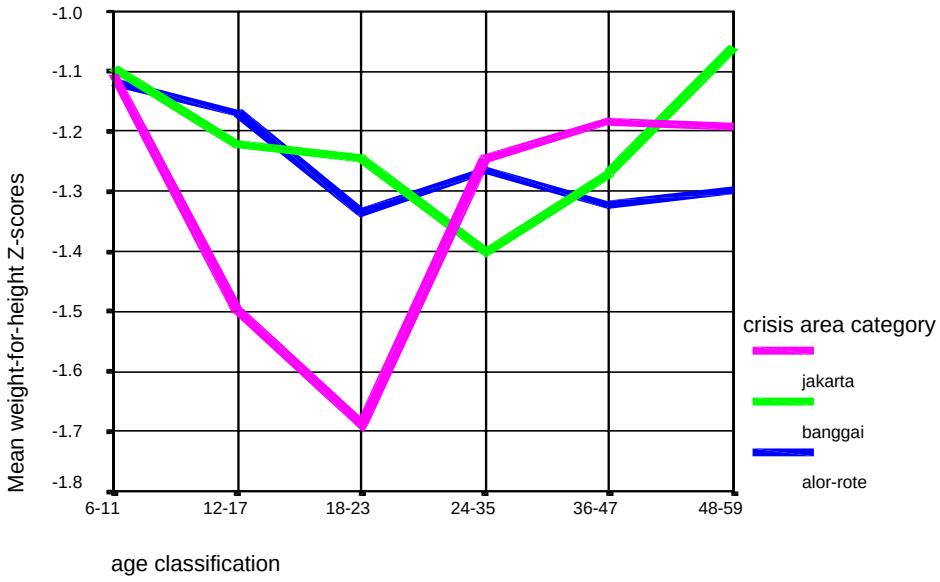


Figure 5. Mean weight-for-height Z score (WHZ) of children 6-59 months of age

Only 21.2% of mothers could be classified as having appropriate food habits based on the scoring of meals provided that consisted of combined carbohydrate and protein-rich foods to their under-five children 3 times daily or more. Based on the scoring of combined of food habits and food production conditions that reflected households' food availability, only 37.6% of the sample households could be classified as having appropriate food availability. And, scoring of combined daily intake of carbohydrate-rich, protein-rich, iron-rich and vitamin A-rich foods that reflected the variety of food intake, showed that only 15.1% of under-five children in the rural area of Alor-Rote could be classified as having an appropriate variety of food intake. It varied from 12.2% daily intake of plant protein-rich foods, 37.7% daily intake of iron-rich foods, 40.6% daily intake of vitamin A-rich foods, 68.0% daily intake of animal protein-rich foods, 69.3% daily intake of total protein-rich foods, and 85.9% daily intake of carbohydrate-rich foods.

Nutritional Status of the under-five children

Nutritional status can be indicated in various ways. However, the level of nutrition status indicated by age, weight and height is often used as an important index of the nutritional status of a community. In crisis situations such as famines, refugee crises or economic crisis, rapid anthropometric surveys are useful for determining the need for and type of relief rations and for establishing priorities for the allocation of resources.[2] In this study, the nutritional status of children aged 6-59 months in different study areas was determined using height-for-age, weight-for-height, and hemoglobin value. The severity of wasting (low weight-for-height) as the recent-onset of malnutrition was closely related to the economic crisis. On the other hand, the indicator height-for-age reflects the cumulative effects of socio-economic, health and nutrition problems; and stunting (or low height-for-age) is a predictor of risk and reflects the overall level of development that points to poverty, low socio-economic conditions and the prevalence of chronic diseases.[15,16] Furthermore, ane-

mia (or low hemoglobin value) is representing iron deficiency that almost always accompanied protein-energy malnutrition.[11]

Wasting status in different study areas

The severity of wasting among children 6-59 months in all study areas was categorized as critical or very high in its severity (the prevalence of wasting was >15%) as shown in Figure 4. No difference was found in the prevalence of wasting between the study areas. However, the lowest mean of WHZ value (Fig 5) and the highest prevalence of low weight-for-height found among children aged 12-23 months (typically known as the peak period of low weight-for-height) in the urban poor areas of Jakarta compared to the other study area shows that under-five children in the urban poor area of Jakarta were more affected by the recent economic crisis.

Backward multiple linear regression and path analyses for the pool data sets of the urban poor area of Jakarta, and the rural areas of Banggai and Alor-Rote revealed that the poor urban areas of Jakarta and child morbidity were the significant determinants for WHZ (Fig 6) with the following equation:

$$WHZ = -1.134 - 0.400_{Jakarta} - 0.194_{Child\ morbidity}.$$

The low proportion of sample households with sufficient purchasing power, low proportion of sample households with appropriate maternal and childcare, and high proportion of sample households with under-five children with infectious diseases (especially respiratory tract infections) in all study areas can be related to a very high/critical severity of wasting found in this study. The higher prevalence of wasting found among children in Jakarta can be related to its significant associations with child morbidity that can directly affect the child's nutritional status. It can also be related to its association with mothers' BMI that can influence the quality of childcare; and to the possession of motorcycles, commonly used to earn income in Jakarta and affect the purchasing power for food. Although s more than 50% of sample households had appropriate 'luxury' goods status, low purchasing power found in the urban poor area of Jakarta could be related to a very low proportion of parents, especially fathers that had regular income.

For the rural area of Banggai, besides an unexpected association found between wasting and the possession of KMS cards, only the child morbidity status was found to be significantly associated with the child's wasting status. And, for the rural area of Alor-Rote, child morbidity status was not significantly associated to the child's wasting status. On the other hand, a household's access to electricity could be related to households' poverty status; mother's educational level could also be related to household poverty status, appropriate maternal and childcare, and household food availability in terms of appropriate purchasing power and appropriate food habits, all of which were significantly associated with the lower prevalence of child wasting.

Backward multiple linear regression and path analyses for those living in the urban poor areas of Jakarta demonstrated that the variety of food intake was not a predictor/determinant of child malnutrition in this study. Child morbidity sta and appropriate household food availability were significant predictors with a direct effect on the WHZ with the following equation:

$$WHZ = -1.136 - 0.129_{households'\ food\ availability} - 0.131_{Child\ morbidity}.$$

Child morbidity s also mediated the relationship between appropriate household food availability and the WHZ value (Fig 7).

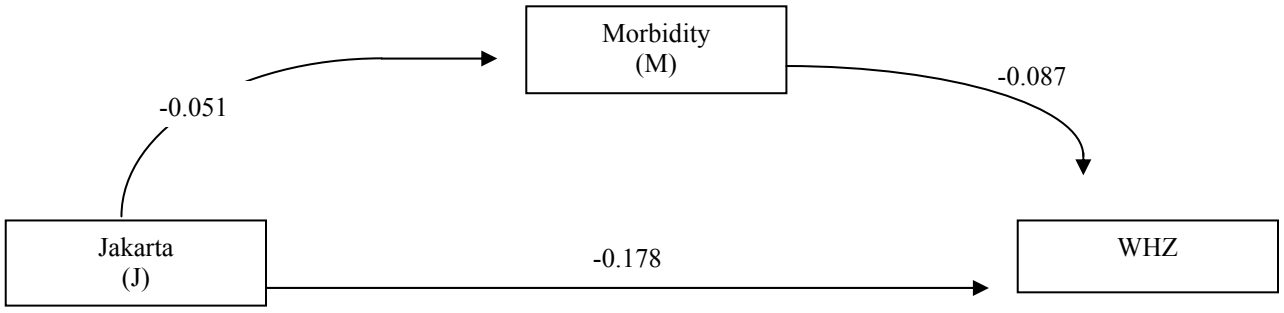


Figure 6. Path model for WHZ value among children 12-23 months of age for pool data set (perfectly fit)

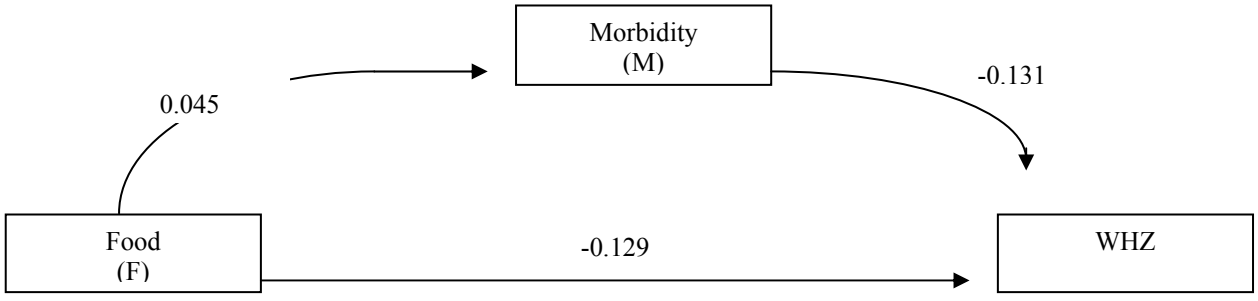


Figure 7. Path model for WHZ value among children 12-23 months of age for Jakarta study site (substantially fit)

Unexpectedly, not only was there a negative association between child morbidity and the wasting indicator (WHZ), but there was also a negative direct association found between a household's food availability and WHZ, and a positive association of a household's food availability with child morbidity in Jakarta. In this study, a household's food availability variable, was not determined as food per se, but as its proxy, through a scoring of the variables of purchasing power and food habits. Households with appropriate purchasing power and appropriate food habits should have better nutritional status. However, in the urban poor area of Jakarta, almost everything must be paid inescapably: house rent, electricity, water and so on, and what (money) is left will be spent on food, health and education, so the connection is less certain

The prevalence of wasting among children under-five years of age can be used to characterize the severity of the situation as it is strongly predictive of concurrent crude mortality of the population: Increased mortality is apparent when the prevalence of this type of malnutrition exceeds 5%.[2] The critical severity of this recent-onset of malnutrition found in this study is alarming because the wasting was found to be more than 20% in all study areas. It is worse than the situation in places generally regarded as the poorest parts of the world, namely Western Africa (15.6%) or South Central Asia (15.4%) in 1995, while the global prevalence is only about 9%.[15]

Stunting status in different study areas

Although the height-for-age of older children is reflective of past nutritional and environmental conditions, it may indicate conditions currently being experienced by younger children in that community.[2] In areas of high prevalence, the age of the child modifies the interpretation of height-for-age. For younger children (under 2-3 years), low height-for-age probably reflects a continuing process of "failing to grow" or "stunting"; for older children, it reflects a state of "having failed to grow" or "being stunted".[2] Accordingly, most young children in the lower socio-economic groups of underdeveloped countries become stunted during the weaning period, and they are likely to remain stunted when they enter school and as adults.[19]

Related to the time of data collection, which was nearly 2 years after the economic crisis started (1999/2000), Figure 8 shows the conditions of "stunting" and "being stunted" in the different study areas among those aged less than 24 months and aged 24 months and over, respectively. The highest prevalence of stunting found among children in both age categories in the rural area of Alor-Rote indicates that both past and current nutritional- and environmental conditions experienced by those children living in the rural area of Alor-Rote were worse compared to the other study areas as shown in Figure 8. The urban poor areas of Jakarta and the rural area of Banggai only were affected by the economic crisis while the rural area of Alor-Rote also suffered from the long drought, a common condition for the area.

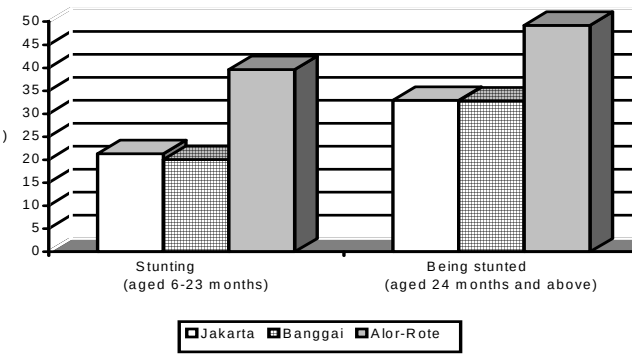


Figure 8. The prevalence of low HAZ (stunting) in different study areas by age category

The greater severity of child stunting in the rural area of Alor-Rote found in this study was significantly associated with variables known to be closely related to household poverty status: no access to electricity, possession of electronic goods (radio and television), limited possession of transportation means (motorcycle) and inappropriate housing conditions and environment sanitation, besides inappropriate maternal nutritional knowledge and child morbidity. This finding supports the WHO view that a high prevalence of low height-for-age indicates poor nutrition, high morbidity risk from infectious diseases, or, most often, both, with which the worldwide prevalence of stunting is considerable, ranging from 5 to 65% among less developed countries.[2] In addition, it is estimated that, in the year 2000, 33% of children under-five in developing countries were stunted.[15] For the rural area of Banggai, only households with a working mother were found to have a significantly lower prevalence of child stunting. On the other hand, for the urban poor areas of Jakarta, low educational level of fathers, insufficient purchasing power, and inappropriate latrine facilities, all closely related to household poverty status, were significantly related to a higher prevalence of child stunting.

The severity of stunting in this study in different study areas, i.e. urban poor area of Jakarta, rural area of Banggai and rural area of Alor-Rote, is higher than the prevalence of stunting among under-five children in the Congo after the devaluation of the African franc in 1994. The prevalence of stunting in the rural area of Alor-Rote (47.8%) was similar to the estimated prevalence of stunted children in Eastern Africa (48%) and South Central Asia (44%) for the year 2000. The condition is even worse compared to what happened in the Sudan after the 1983-1985 drought that extended to chronic and/or transitory food insecurity. The rural area of Alor-Rote had similar conditions to the less developed villages of West-Sumatra before the economic crisis (of 53.1%)(17). On the other hand, for the urban poor area of Jakarta and the rural area of Banggai, the condition was better compared to the estimated prevalence of stunted children, even in South East Asia (of 33%) for the year 2000. However, it is similar to the estimated global prevalence of stunting for the year 2005 (of 29%). For the urban poor area of Jakarta (26.3%), the finding is similar to the prevalence of stunting in the eastern-part of Jakarta in 1999 surveyed by Pritasari (of 22.0%). For the rural area of Banggai (27.8%), it was similar to the more developed villages in West Sumatra before the economic crisis (of 30.6%)(17). Higher energy availability, female literacy and gross

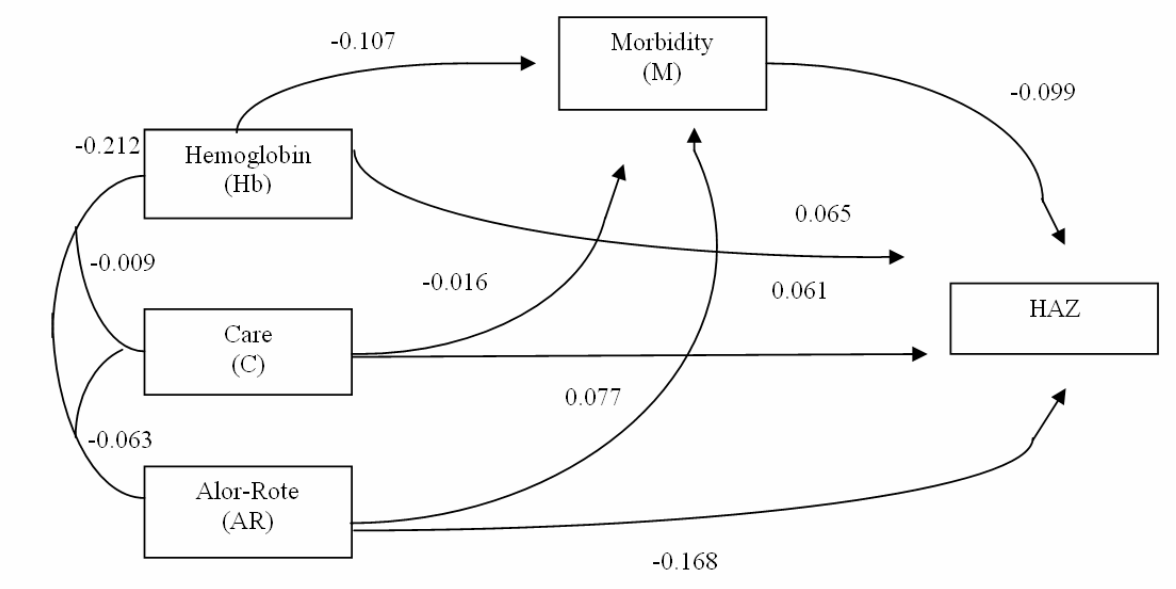


Figure 9. Path model for HAZ value among children 6-59 months of age in pool dataset (substantially fit)

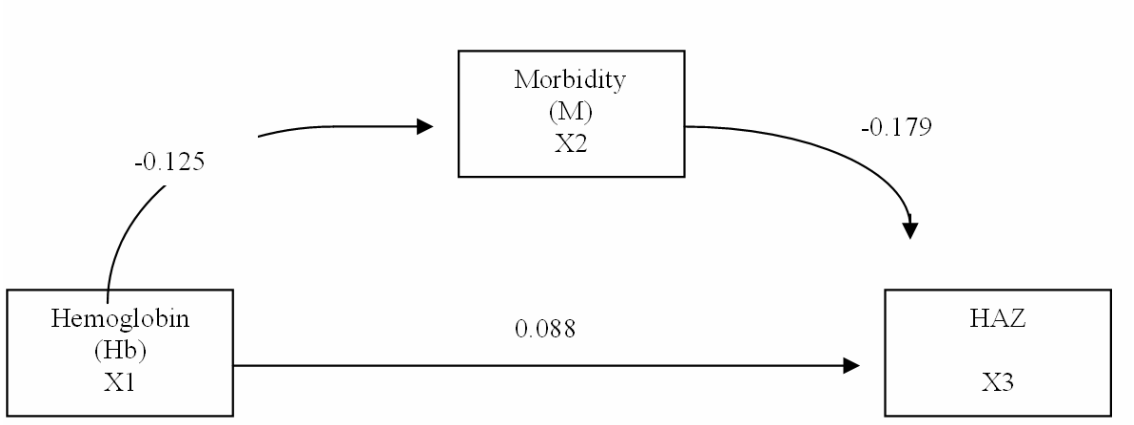


Figure 10. Path model for HAZ value among children 6-59 months of age in Alor-Rote study site

domestic product were the factors mostly associated with lower prevalence of stunting.[19]

Backward multiple linear regression and path analyses for the pooled data sets of the urban poor area of Jakarta and the rural areas of Banggai and Alor-Rote, provided determinants of HAZ for the rural area of Alor-Rote (Fig 9) according to the following equation:

$$HAZ = -1.425 - 0.407_{\text{Alor-Rote}} - 0.020_{\text{Age}} + 0.064_{\text{Maternal and childcare}} - 0.241_{\text{Child morbidity}} + 0.048_{\text{Hemoglobin}}.$$

For the rural area of Alor-Rote, child morbidity status and hemoglobin value were significant determinants that had direct effects on the HAZ according to the following equation:

$$HAZ = -1.871 - 0.011_{\text{Age}} - 0.440_{\text{Child morbidity}} + 0.065_{\text{Hemoglobin}}.$$

Besides, child morbidity status also mediated the relationship between hemoglobin value and HAZ value (Fig 10).

For under-five children living in the rural area of Banggai, only appropriate access to health services was a significant determinant with a direct effect on the HAZ and the Path-model was classified as a poor fit with the following equation:

$$HAZ = -0.947 - 0.029_{\text{Age}} + 0.225_{\text{access to Health services}}.$$

For those living in the urban poor areas of Jakarta, appropriate maternal and childcare and hemoglobin value were significant determinants with direct effects on the HAZ value and the Path-model was also classified as a poor fit with the following equation:

$$HAZ = -1.736 - 0.030_{\text{Age}} + 0.069_{\text{Hemoglobin}} + 0.121_{\text{Maternal and childcare}}.$$

For the urban poor area of Jakarta, hemoglobin value also mediated the relationship between appropriate maternal and childcare and HAZ.

The very high severity of stunting found among under-five children such as those in the rural area of Alor-Rote is also disturbing for the causes of chronic growth-retardation in under-five or preschool children which are more complex than energy deficiency alone. If height is not gained in early life, it cannot be fully recovered later. Protein and micronutrient, as well as energy deficiency, are often involved. In addition, a high frequency of diarrhea and respiratory infection can result in protein-energy

deficiency even when the diet would otherwise be adequate.[20] As stated by the East Asian Nutrition Enigma,[21] factors most closely associated with stunting in children in East Asian countries are malaria, and the availability of food protein, especially animal protein, the levels of adult literacy, and of female secondary school enrolment, as well as both national income per capita and the public expenditure in education. There is also increasing recognition of the harmful consequences of stunting throughout the course of life, including increased mortality, decreased cognitive function and intelligence, and increased risk of degenerative diseases such as diabetes and high blood pressure. Therefore, the measure of child growth proposed to assess the success of development in the next decade is a reduction in stunting by two years of age.[21]

Anemic status in different study areas

Nutritional anemia is almost always found together with protein-energy malnutrition. It is one of several nutritional diseases related to poverty, famine and organic disease.[22] It may result from dietary deficiency of iron, folate, vitamin B12 and/or severe dietary protein malnutrition. Nutritional iron deficiency may result from poor iron intake if the diet contains little meat or a high content of factors that inhibit iron absorption, or where there is a high prevalence of intestinal parasitosis. On the other hand, folate deficiency may result from a poor intake of leafy vegetables and legumes. And, for B12, it comes from animal foods and becomes deplete with chronic low intake, despite hepatic storage capacity. Measurement of the concentration of hemoglobin in whole blood is probably the most widely used screening test for iron deficiency anemia.[11,12]

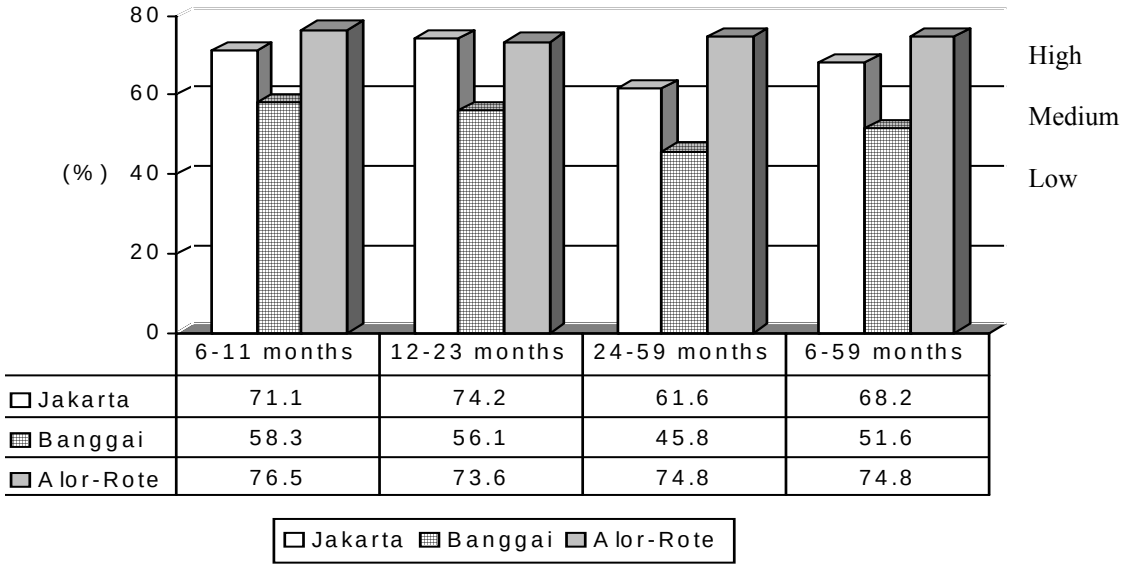
Based on the geographical pattern of anemia (low hemoglobin value) among pre-school children,[15] the high prevalence of anemia among children aged 6-59 months in the rural area of Alor-Rote as shown in Figure 11 (≈75%) was as high as it is in South Central Asia. For the rural area of Banggai (51.6%), the pattern was similar to the condition in Africa where it ranges from 47% in Eastern Africa to 56% in Western Africa. And, for the urban poor area of Jakarta (68.2%), the pattern was in between Africa and South Central Asia.

Among factors causing anemia in under-five children, a very high prevalence of anemia found in Upper Egypt (1999) showed that breast feeding patterns, economic status, parasitic load, and the anemic state of mothers were all significantly associated with the risk of anemia.[23] The high severity of anemia (prevalence >40%) in all the study areas might be related to the high proportion of children reported sick and also to the low intake of iron-rich foods in all study areas. In addition, it was also found that there was a significant association between access to complete immunization and the lower prevalence of anemia among under-five children in the urban poor area of Jakarta. In the rural area of Banggai, a significantly higher prevalence of anemia was found among under-five children of households had no cultivated land. For the rural area of Alor-Rote, a significantly higher prevalence of anemia was found among children from households with inappropriate parental educational level that had no access to electricity, possessed no television or motorcycle, had no access to safe drinking water, inappropriate maternal nutritional knowledge, had no KMS card, inappropriate access to health services and had infectious diseases.

Backward multiple linear regression and path analyses of the pooled datasets of the poor urban area of Jakarta, and the rural areas of Banggai and Alor-Rote, although the Path-model was classified as a poor fit, revealed that, beside household employment status, access to health services and child morbidity, the poor urban areas of Jakarta and the rural area of Alor-Rote were significant predictor determinants for hemoglobin with the following equation:

$$\text{Hemoglobin} = 10.855 - 0.485_{\text{Jakarta}} - 0.702_{\text{Alor-Rote}} - 0.534_{\text{Employment status}} + 0.210_{\text{Access to health services}} - 0.286_{\text{Child morbidity}}$$

For those living in the urban poor areas of Jakarta and the



	6-11 months	12-23 months	24-59 months	6-59 months
Jakarta	71.1	74.2	61.6	68.2
Banggai	58.3	56.1	45.8	51.6
Alor-Rote	76.5	73.6	74.8	74.8

Figure 11. Prevalence of anemia (hemoglobin less than 11.0 g/dL) of children 6-59 months by age

rural area of Banggai, appropriate access to health services was a significant determinant that had a direct effect on the hemoglobin - and the Path-model was both classified as only a fair fit with the following equation:

$$\text{Hemoglobin} = 9.569 + 0.021_{\text{Age}} - 0.405_{\text{Sex}} + 0.140_{\text{Access to health services}} \text{ (for Jakarta) and}$$

$$\text{Hemoglobin} = 11.570 - 0.534_{\text{Access to health services}} \text{ (for Banggai).}$$

For the rural area of Alor-Rote, appropriate household employment status, appropriate environmental sanitation, appropriate access to health services and child morbidity status were predictor determinants that had direct effects on the hemoglobin value and the Path-model was classified as substantially fit, with the following equation:

$$\text{Hemoglobin} = 9.954 - 0.734_{\text{Employment status}} + 0.094_{\text{Environmental sanitation}} + 0.284_{\text{Access to health services}} - 0.303_{\text{Child morbidity}}.$$

Besides, for the rural area of Alor-Rote, child morbidity status mediated the relationship between household employment status, environmental sanitation status, access to health services and hemoglobin. Environmental sanitation and access to health services also mediated the relationship between household employment status and hemoglobin (Fig 12).

The highest prevalence of anemia found among children aged 6-59 months in the rural area of Alor-Rote, compared to the other study areas, shows that it might be related to the highest proportion of under-five children reported sick (especially in terms of fever) due to infection or inflammation which generates iron deficiency anemia and profound changes in iron metabolism.[24] Besides, it might also be related to the lowest proportion of under-fives having daily intakes of iron-rich foods compared to the other study areas. Although children aged 6-59 months in the rural area of Alor-Rote were found to have a higher proportion of under-fives having daily intake of animal rich-foods compared to the urban poor area of Jakarta, it was mostly fish (non heme-iron food source) rather than red meat (heme-iron food source). In addition, more children aged 6-59 months in the urban poor area of Jakarta consumed vitamin A-rich foods that may affect iron transport and storage within the body. Also, in terms of plant-protein-rich foods that mostly consist of soybean-based foods such as tofu and tempe, these are consumed more by children 6-59 months in the urban poor areas of Jakarta and render the iron more available.[25]

The higher prevalence of anemia among children 6-59 months in the urban poor areas of Jakarta compared to the rural area of Banggai might represent a greater proportion of children reported sick. Children aged 6-59 months in the study area of Jakarta also had a lower proportion of under-fives having daily intake of iron-rich and animal protein-rich foods compared to the study area of Banggai. Latief et al (2000) also noted that during the economic crisis, while the amount of food energy appeared not to have been influenced by the crisis, it changed the composition of the diet. The more expensive food items, such as meat, eggs, milk and other animal foods were replaced by cheaper sources of energy and protein.[26]

Iron deficiency anemia is a problem among the lower income population, because their diet contains less red meat as a source of heme-iron compared to the middle- and upper-income population. It is much better absorbed than the non-heme iron from vegetable diets. Moreover, lower income groups are more likely to have diseases such as hookworm, malaria, or schistosomiasis that exacerbate iron deficiency. Eliminating these diseases is a contribution to the campaign against iron deficiency.[20]

In this study, Alor-Rote is known as one of the seasonal-malaria areas in Indonesia. Malaria is the single largest contributor to the etiology of severe iron defi-

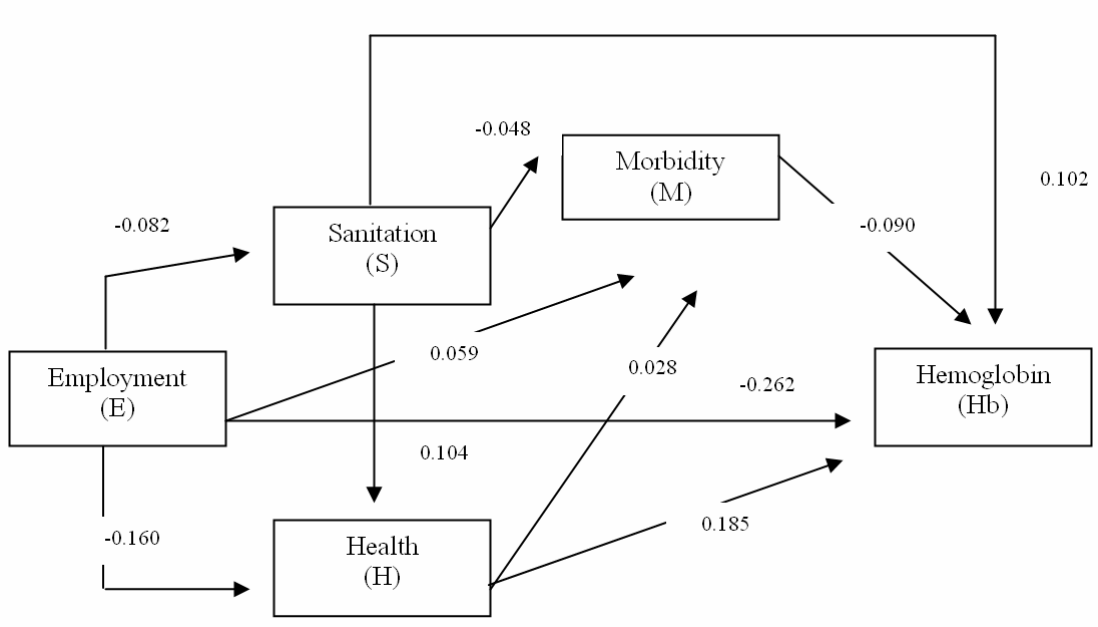


Figure 12. Path model for hemoglobin value among children 6-60 months of age in Alor-Rote (substantially fit)

ciency anemia in seasonal-malaria areas. A recent study among under-five children in Africa found that iron deficiency and malaria were combined determinants of anemia in African children.[27] A recent study in Alor-district confirmed that anemia among children 6-10 years was associated with malaria parasitaemia and splenic enlargement.[28]

Anemia is also related to thalassemia that is commonly found in South-East Asia including Indonesia. A study in Cianjur, West Java, Indonesia[29] found a prevalence of carrier thalassemia among women of childbearing age of 41.3% compared to 30% in Thailand. Therefore, the thalassemic-trait should be considered in designing any program for the reduction of the prevalence of anemia in Indonesia. The thalassemic-trait carrier may have symptoms and signs of mild anemia and an increase in red cell osmotic fragility.

The high prevalence of anemia found in all study areas is a serious problem because the earliest function that is affected by iron deficiency is cognition and behavior. Iron deficiency will affect the brain enzymes responsible for neuron development that will inhibit key neurotransmitters with consequences evident in later life. Tests of brain function and scholastic achievement are reduced in iron deficiency, and this is usually not reversible unless the deficiency is mild. In addition, one study in Alaska reported that iron deficiency was associated with increased diarrhea and respiratory diseases, and meningitis was observed to be fatal only in anemic children. And, a decrease in diarrhea and respiratory infections was observed in the groups receiving iron supplementation. Supplementary iron given to iron deficient children has shown growth improvement in Indonesia, Kenya and Bangladesh.[20]

CONCLISIONS

During the 1999 economic crisis in Indonesia, wasting affected more children in the urban poor areas of Jakarta than in other more rural study areas. On the other hand, stunting and anemia were significantly more severe among children 6-59 months of age in the rural area of Alor-Rote as compared to the other study areas.

Food intake did not emerge as a key determinant of malnutrition in any study area. On the other hand, infectious diseases were consistently revealed as key determinants of wasting in the urban poor areas of Jakarta and the rural area of Banggai. It was also consistent as a key determinant for stunting in all study areas and also for anemia in the urban poor areas of Jakarta and the rural area of Alor-Rote. Household luxury goods status did not emerge as a key determinant of child malnutrition in any study area. Household employment status was a key determinant of stunting and anemia in the rural area of Alor-Rote: however, working mothers were positively related to a higher prevalence of stunting and anemia.

Recommendations

The study has highlighted the need to improve the nutritional status of under-five children and their mothers both in the poor urban and rural areas. Since child morbidity was highly prevalent both in urban poor and rural areas and closely related to poor accessibility to health services, health programs especially for poor households should be prioritized. A social safety net program in the form of food aid should be built into the existing health care system.

Since effective decentralization is a key platform to achieve high access and coverage of basic health services across the country, capacity building will be the critical activity of decentralization, aiming to empower the relevant agencies at provincial, district and peripheral levels to manage health and nutrition programs and to solve their own specific problems with agreed priority setting. Revitalization of the *Posyandu, Puskesmas* and improvement in health staff capacity at the district level should be a high priority. Furthermore, since mothers play important roles in the prevention of child malnutrition, good health status of women of reproductive age is essential. To improve the child's nutritional status, there needs to be simultaneous improvement in household food availability, reduced child morbidity and effective operation of the existing health and nutritional surveillance system.

Since crisis can occur in different forms, e.g. natural disasters like prolonged-drought or flood, volcanic eruption, earthquake or tsunami with subsequent famine, failure of agriculture with pestilence or contamination,, chronic civil war, mass displacement with civil unrest, economic disaster or poor economic policies, more efforts should be made to undertake operational research in the area of health and nutrition intervention during crisis situations using both quantitative and qualitative approaches. Models and scenario planning can provide indicators to predict community nutritional conditions across Indonesia for any crisis situation. Academic research should be built-in to on-going intervention programs using the cohort design. Academic institutions should proactively build partnerships with those agencies responsible for community interventions.

ACKNOWLEDGMENTS

The authors would like to express their deep gratitude to World Vision International-Indonesia for collaboration and permission to conduct advanced data analyses.

REFERENCES

1. Bielicki T. Physical growth as a measure of the economic well-being of populations: the twentieth century. In: Falkner, F., and Tanner, J. M. ed. Human growth. A comprehensive treatise. Methodology ecological, genetic, and nutritional effects on growth. Plenum Press, New York and London, 1986.
2. World Health Organization. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. World Health Organization, Geneva, 1995.
3. Golden, M. H. N. Is complete catch-up possible for stunted malnourished children? Eur J Clin Nutr. 2000;48:558-571.
4. Caliendo, M. A. Poverty and Its Relationship to Malnutrition: Strategies for Increasing the Purchasing Power of the Poor. In: Nutrition and the world food crisis. MacMillan Publ. Co. Inc., New York, 1979.
5. Brockerhoff, M. Child Survival in Big Cities: The Disadvantages of Migrants. Soc Sci Med. 1995;49:1371-1383.

6. Utomo, B. Dampak krisis moneter dan kekeringan terhadap status kesehatan dan gizi anak. In: Dampak krisis moneter dan bencana El Nino terhadap masyarakat, keluarga, ibu dan anak di Indonesia. LIPI, Jakarta, 1998.
7. Hop, L. T. Growth patterns of Vietnamese children from birth to 17 years old in Hanoi (A Longitudinal study between 1981 to 1999). Doctoral Thesis. Post-Graduate Program University of Indonesia, Jakarta, 1999.
8. Raharto, A., and Romdiati, H. How to define poor households. In: Seta, A. K., Atmowidjojo, M, Atmojo, S. M. Mengambil hikmah krisis ekonomi dan moneter dalam membangun ketahanan pangan dan gizi masyarakat yang lebih kokoh dan efektif di masa depan. WNPG VII.. LIPI, Jakarta, 2000.
9. Sumarto, S., Wetterberg, A., and Pritchett, L. The Social Impact of the Crisis in Indonesia: Results from a Nationwide *Kecamatan* Survey. Preliminary Draft. Jakarta, 1999.
10. Gibson, R. S. Principle of Nutritional Assessment. Oxford University Press, New York, 1990.
11. World Health Organization. The management of nutrition in major emergency. World Health Organization, Geneva, 2000.
12. Badan Pusat Statistik. Welfare statistics 1999. Household welfare statistic division ed. BPS, Statistics Indonesia, Jakarta, 2000.
13. Ministry Of Health (MOH). Food and nutrition situation in Indonesia 1999-2000. National food and nutrition surveillance system team. Depkes, Jakarta, 2000.
14. ACC/SCN, 2000. Fourth report on the World Nutrition Situation: Nutrition throughout the life cycle. Geneva: ACC/SCN in collaboration with IFPRI, 2000.
15. Reinhard, I., and Wijayaratne, K. B. S. The use of stunting and wasting as indicators for food insecurity and povery. In: PIMU Open Forum. Integrated Food Security Program Working Paper 27. Trincomalee, Srilanka, 2001.
16. Sudiman, H. Nutritional status of the target groups in the less-developed villages (IDT) program in West Sumatra, Indonesia 1994 compared with 1995. Doctoral thesis. Post-Graduate Program University of Indonesia, Jakarta, 1998.
17. Pritasari, Nutritional status of under-five children and their mothers before and during monetary crisis in East Jakarta. MSc. Research Report. Post-graduate Program University of Indonesia, Jakarta, 1999.
18. Frongilo, E. A., de Onis, M., and Hanson, K. M. P. Socio-economic and demographic factors are associated with worldwide patterns of stunting and wasting of children. J. Nutr. 1997;127:2302-2309.
19. Scrimshaw, N. S. The consequences of hidden hunger for individuals and cosieties. Food and Nutr. Bull. 1994;15:3-24.
20. Shrimpton, R. An Analysis of the patterns and causes of child malnutrition in countries of the East Asia and Pacific region, together with extensive external comparison, and recommendations for programmes to accelerate declines in stunting. In: The East Asian nutrition enigma. England, 2001.
21. Ball, M. Nutritional disease related to poverty, famine and organic disease. In: Wahlqvist, M. L. ed. .Food and Nutrition. Allen & Unwin Pty Ltd, St. Leonards, NSW, Australia, 1997.
22. El-Sayed, N, Gad, A., Nofal, L., Zeid, H. A., El-Morshedy, and El-Waseef, S. Assessment of the prevalence and potential determinants of nutritional anaemia in Upper Egypt. Food and Nutr. Bull. 1999;20:417-421.
23. Walter, T., Olivares, M., Pizarro, F., and Muñoz,C. Iron, anemia, and infection. Nutr. Rev. 1997;55:111-124.
24. Lynch, S. R. Interaction of Iron with other Nutrients. Nutr.Rev. 1997;55:102-110.
25. Latief, D., Atmarita, Minarto, Jahari, A. B., and Tilden, R. The trend of household food consumption before and during the crisis in Indonesia. In: Seta, A. K., Atmowidjojo, M, Atmojo, S. M. ed. Mengambil hikmah krisis ekonomi dan moneter dalam membangun ketahanan pangan dan gizi masyarakat yang lebih kokoh dan efektif di masa depan. WNPG VII. LIPI, Jakarta, 2000.
26. Verhoef, H. Iron deficiency and malaria as determinants of anemia in African children. Thesis Wageningen University, The Netherlands, 2000.
27. Chiwile, F. P. Anemia and its determinant factors among school children 6-10 years in Alor District, East Nusa Tenggara Province, Indonesia. MSc. Research Report. Post-graduate Program University of Indonesia, Jakarta, 2001.
28. Saidin, S., Suwardi, S. S., Murdiana, A., Christiani, R., Martuti, S., Pambudi, J., and Muhilal. The prevalence of anemia and carrier thalasemia among women childbearing age. Penel. Gizi Makan. 2001;24:28-43.

Original Article

Determinants of child malnutrition during the 1999 economic crisis in selected poor areas of Indonesia

Saptawati Bardosono MD PhD, Soemilah Sastroamidjojo MD and Widjaja Lukito MD PhD

South East Asian Ministries of Education Organization Regional Center for Community Nutrition at the University of Indonesia, Jakarta, Indonesia

1999 年經濟危機期間印尼貧窮地區兒童營養不良之決定因素

國家層級的實徵證據指出，1999 年印尼經濟危機對城鄉地區及橫跨的區域的衝擊迥異。一個橫斷性營養狀況研究在雅加達貧窮的城市地區，及蘇拉維西中部的 Banggai 和 East Nusa Tenggara 的鄉村地區進行。以兩階段集束抽樣，分別抽出雅加達貧窮地區 1078 個，Banggai 262 個及 Alor-Rote 631 個有五歲以下孩童的家戶。數據收集從 1999 年 1 月起到 2001 年 6 月止。此研究顯示在雅加達貧窮的地區，耗損的影響的兒童較其他地區多。另一方面，在 Alor-Rote 的鄉村地區 6-59 個月大孩童發育遲緩及貧血的情形較其他地區嚴重。傳染性疾病的高盛行率與雅加達及 Banggai 研究地區較高的耗損盛行率具有顯著的相關，也與 Alor-Rote 研究地區較高的發育遲緩及貧血盛行率具有顯著相關。為避免此種因經濟下滑而健康受到衝擊，需要透過既存之健康照護系統，以改善五歲以下孩童及其母親的營養及健康狀況。不論地區，提供基本的健康服務及增進衛生人員的能力，是地方分權過程的一部份。

關鍵字：危機、貧窮、經濟、新開始的營養不良(耗損)、慢性營養不良(發育遲緩及貧血)、決定因素、五歲以下孩童、雅加達、Banggai、Alor-Rote。