Factors associated with undernutrition and improvement in Indonesia

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Abstract. Stunting among children under five years of age is one of the big problems in Indonesia, damaging adulthood health and work productivity. Studies on the individual and household factors of this issue had been conducted massively. Nonetheless, regional level study on the same issue is still lacking whereas it is important in understanding the problems to formulate better policies. This study aimed to analyze factors associated with stunting prevalence at the provincial level. Data for this study was obtained from the publication of the National Socioeconomic Survey 2018 and Basic Health Research 2018. Multiple linear regression was applied to analyze factors associated with stunting prevalence. There were proportion of expenditure on fish, meat, eggs and milk, tofu and tempe, fruits and vegetables (F&V), cigarettes, and energy and protein intake. Prevalence of stunting at the provincial level was very wide, from 16.2% to 37.9%. Protein adequacy was higher (106.2%) than the Recommended Dietary Allowance. Average proportion of food expenditure at provincial level was 50.1%, in each province ranging from 40.6% to 57.2%; while the highest proportion of expenditure was to purchase F&V (12.8%). The model predicted that the proportion of household food expenditure, proportion of F&V, and protein adequacy were significantly associated with stunting prevalence. Thus, policy on improving household purchasing power and food consumption behavior with balanced nutrition is the key factor in reducing the prevalence of stunting. Social protection programs such as cash transfer and food aid for low-income households should be continued with more accurate recipients.

1. Introduction

Stunting among children under five years of age is one of the big problems in Indonesia. One in three children under five in Indonesia is reported experiencing stunting [1]. Stunting in childhood is generally associated with poor outcomes throughout the life cycle [2]. Stunting impairs health, cognitive, socio-emotional functions and later reduces work productivity and increases mortality [3].

Stunting arises from a complex interaction of individual, household, and community factors. Low birth weight, inadequate feeding, and infection were individual determinants of stunting, while poor care practices, poor sanitation and water treatment, paternal and maternal smoking, and household wealth were household and family factors [4–6]. Some studies found that poverty level, education level, and per capita gross domestic product were ecological factors of stunting [4,7].
Studies on the individual and household factors of this issue had been conducted massively. Nonetheless, regional level study on the same issue is still lacking whereas it is important in understanding the problems to formulate policies more precisely. This study aimed to analyze factors associated with stunting prevalence at the provincial level. Based on the description above, cost-effective interventions related to these factors will help improve the quality of human resources and reduce stunting in Indonesia.

2. Materials and methods

2.1. Materials

Data on household expenditure (IDR/cap/month) as well as energy and protein intake were provided by the National Socioeconomic Survey 2018 from Statistics Indonesia [8]. Data on stunting prevalence of under-five children were obtained from Basic Health Research 2018 from Indonesian Ministry of Health [9].

2.2. Methods

Total food expenditure was divided by total household expenditure to get a share of food expenditure, while the proportion of expenditure on a food item was obtained by dividing the expenditure of the respective food item by total food expenditure [10]. In total, expenditure on the six food groups were included in the study, namely fish, meat, eggs and milk, fruits and vegetables, and cigarettes. Energy and protein intake was converted into energy and protein adequacy (%) using the current RDA (2,100 kcal energy and 57 g protein).

Provincial stunting prevalence of under-five children was categorized as very low (<2.5%), low (2.5–<10%), medium (10–<20%), high (20–<30%), and very high (≥30%) [11]. Multiple linear regression was applied to analyze factors associated with stunting prevalence. A p-value less than 0.05 was statistically significant.

3. Results and discussion

The prevalence of stunting at the provincial level in 2018 was very wide, from 16.2% to 37.9%. Stunting was still a big problem in provinces in Indonesia, shown by more than half of the provinces (52.1%) or 18 provinces had very high stunting problems. The other big proportions (44.1%) of the provinces were categorized as high stunting problems. Having the lowest prevalence of stunting, DKI was the only province categorized as having medium public health problems (Figure 1).

Mean energy adequacy reached almost 100%, which was 99.6%, while adequacy for protein was even higher, reaching 106.2%. However, there were still four provinces with inadequate energy, namely West Kalimantan (77.4%), Maluku (84.8%), North Maluku (86.7%), and Papua (87.7%). Papua was the only province with inadequate protein (77.3%). The high energy and protein inadequate in Maluku, North Maluku, and Papua may be caused by limited access to food due to lack of infrastructure like roads. These provinces has been prioritized for food and nutrition security program [12].

The average proportion of food expenditure was 50.1%, ranging from 40.6% to 57.2%. Among the six food groups, the highest proportion of expenditure was to purchase fruits and vegetables (F&V) (12.8%), ranging from 10.0% to 16.4%, followed by cigarettes (12.3%), fish (9.6%), eggs and milk (5.6%), meat (3.9%), and tofu and tempe (1.8%). Overall, provinces in the eastern islands of Indonesia, namely Sulawesi, Maluku, and Papua, had high proportion of expenditure on fish since those areas are marine fish. Thus, fish are highly consumed in these areas [13,14]. On the other hand, people in Central Java, DIY, and East Java consumed more tofu and tempe as their main sources of protein. In those provinces, the proportion of expenditure on tofu and tempe was more than 2%.

Among all factors included in the model, the average proportion of household food expenditure, protein adequacy, and proportion of expenditure on F&V were significantly associated with stunting prevalence at the provincial level (Table 1). Almost half (44.6%) of the variations in provincial stunting prevalence can be explained by the respective factors.
Figure 1. Stunting prevalence in 34 provinces in Indonesia. Source: Ministry of Health, 2018, processed.

The province with a higher proportion of household food expenditure had a higher stunting prevalence. It has been known that the proportion of food expenditure can be used as a proxy for household income following the theoretical work of Engel’s [10,15]. It indicates that the higher the proportion of food expenditure, lower the household income. Household wealth as indicators of socioeconomic status was one of the factors directly linked to stunting among children in Indonesia and other countries [4,5,16–18]. Poverty may be responsible for unimproved water and sanitary facility, low maternal education, limited access to health care, and later cause child stunting [6,19].

The other results show that a province with lower protein adequacy had a higher stunting prevalence. This indicates that the less protein consumption, the greater the risk of experiencing stunting, so there is a relationship between protein intake and nutritional status in children under five. Low dietary protein intake caused by lack of animal source-foods has been known associated with growth faltering in children since they contain essential amino acids [6,20,21]. Moreover, consumption of food rich in protein, especially animal sources, was highly affected by income [13,22].

Higher proportion of expenditure on F&V were significantly associated with lower stunting prevalence at the provincial level. Higher proportion of expenditure on F&V indicates higher consumption of F&V. Similar result was also found in a study conducted to Brazilian children finding that low fruits and vegetables consumption frequency was associated with stunting (PR=2.6; 95% CI 1.1–6.1) [23]. Fruits and vegetables are considered as high quality nutritious food since they a range of nutrients and different bioactive compounds including phytochemicals, vitamins, minerals, and fibers.
This poor nutrient intake as the result of lack of food consumption is still the main cause of stunting among children [4–6]. Furthermore, costs of F&V are still relatively high that only upper-income household can afford them [25].

| Variable                              | B     | SE    | β     | p    |
|---------------------------------------|-------|-------|-------|------|
| Energy adequacy                       | 0.119 | 0.198 | 0.185 | 0.554|
| Protein adequacy                      | -0.376| 0.175 | -0.846| 0.042*|
| Proportion of food expenditure        | 0.709 | 0.241 | 0.590 | 0.007*|
| Proportion of expenditure on fish     | -0.167| 0.372 | -0.105| 0.658|
| Proportion of expenditure on meat     | -0.369| 0.634 | -0.099| 0.567|
| Proportion of expenditure on milk and eggs | 1.329 | 1.184 | 0.240 | 0.273|
| Proportion of expenditure on tempe and tofu | 0.572 | 2.007 | 0.055 | 0.778|
| Proportion of expenditure on fruits and vegetables | -1.077| 0.519 | -0.372| 0.049*|
| Proportion of expenditure on cigarettes | -0.382| 0.382 | -0.166| 0.327|

* Multiple linear regression, $r^2 = 0.446$.  
* p<0.05.

4. Conclusions

Prevalence of stunting at provincial level in 2018 were ranged from 16.2% to 37.9%, mostly categorized as having very high public health problems. Proportion of household food expenditure, proportion of expenditure on fruits and vegetables, and protein adequacy were significantly associated with provincial stunting prevalence. Thus, policy on improving household purchasing power and food consumption behavior with balance nutrition is the key factors in reducing prevalence of stunting. Social protection programs such as cash transfer and food aid for the low-income households should be continued with more accurate recipients.

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