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EXPLORING THE LOCAL FOOD CONSUMPTION AND KNOWLEDGE RETENTION FOR STUNTING PREVENTION

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Abstract

Background: Stunting in children may increase their risk of infection, problem associated with growth and development, and also intelligence. Higher than national stunting rate, Central Kalimantan have 26.9% stunting in 2022. Stunting prevention programs such as utilization of local food are encouraged. **Objectives:** This study explores behaviour and the impact of education to the knowledge of Central Kalimantan's resident of local food consumption to decrease stunting in children. **Methods:** A secondary data from cross-sectional survey conducted by Indonesian Gastronomy Community in two regencies within Central Kalimantan Province was analyzed. Participants voluntarily fulfill immediate survey after education (post-1), and 3-month after education (post-2) survey. Compiled data are further analyzed to explore participants understanding. **Results:** A total of 152 post-1 survey and 122 post-2 survey are compiled. Participants answers dietary habit consists of fish (97.54%), vegetable (95.90%), fruits (50%), meat (31.97%), tempeh/tofu (28.68%), egg (27.87%), chicken (8.19%), and milk (8.19%), in descending order. Most consumed plant-based protein are tempeh (76.22%) and tofu (72.13%). Decreased score was observed from the immediate test to the three months after education and survey. **Conclusions:** Residents of Central Kalimantan Province in Indonesia primarily rely on fish, tempeh, and tofu as their main protein sources. These foods are high in protein and readily available in their local environment. To aid in stunting prevention, regular educational programs should be implemented to ensure long-term retention of knowledge.

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Keywords: stunting, local food, protein

Introduction

The greatest risk of stunting is observed during the first 1000 days of life, from conception to 24 months of age. Delays in growth and development can have long-term effects for children's health, intellectual abilities, productivity, achievement, and well-being. Stunting is defined as having a length/height for age that is less than -2 standard deviations (SD) on the WHO growth curve and happens as a result of irreversible circumstances caused by insufficient dietary intake and/or repeated/chronic illnesses.[1] Furthermore, stunting in toddlers correlates to 1,017,000 deaths or 14.7% of all under-five deaths worldwide. Infections like as pneumonia, diarrhea, and measles are the primary causes of this death.[2]

According to the 2022 Indonesian Nutrition Status Survey/ Survey Status Gizi Indonesia (SSGI), Indonesia's estimated stunting rate in 2022 is 21.6%. This average is higher than the previous year's average, which was 24.4% in 2021. The Indonesian government has set a goal of reaching 14% by 2024. With a stunting rate of 26.9% in 2022 and 27.4% in 2021, Central Kalimantan Province is ranked 11th in Indonesia. Actions to prevent stunting can be carried out with interventions focused on young women, pregnant women, breastfeeding mothers, unborn babies, and toddlers, especially at the age of 6 months to 23 months.[3]

Stunting is caused by complex interactions between environmental, social, and economic factors. The World Health Organization (WHO) has developed a specific strategy to combat stunting. It is important to consider the cultural context, food accessibility, education, politics, environment, medical facilities, and hygiene while managing stunting. Therefore, handling stunting requires a comprehensive approach.[4]

Regarding efforts to prevent stunting, parental knowledge of local food is a concern.

Sometimes, local residents are still unaware of the advantages of eating local food to prevent stunting. Research in Central Bengkulu found a strong positive correlation between knowledge about local food and nutritional status, including stunting.[5] Another study in the Central Java Province's Somogede Village, Wonosobo District found that using local foods improved the nutritional status of children who were stunted.[6] There is a research that discusses how Madurese natives thought about stunting and eating. Nutritional issues were not thought to be the cause of stunting. The concept of eating is the idea of "eating rice" So long as there is rice on the plate, eating without additional dishes is acceptable. This idea has an impact on malnutrition in young children under the age of five and improper complementary food feeding methods.[7]

The provincial government of Central Kalimantan is actively supporting the central government's program to intervene the problem of stunting in the region. Some local foods in Central Kalimantan include haruan fish, snakehead fish, baung fish, jelawat fish, lais fish, seluang fish, bajei vegetables, lily vegetables, genjer vegetables, uwei vegetables, kalakai vegetables, cleaver vegetables, and lotus tendrils. This study explores behaviour and the impact of education to the knowledge of Central Kalimantan’s resident about local food consumption to decrease stunting in children.

Methods

This study employed an observational, cross-sectional study design, utilizing secondary data derived from posttests outcomes from a health education program conducted by the Indonesian Gastronomy Community (IGC). The study sample consisted of residents inhabiting

in two regencies, both located in the Central Kalimantan Province, Indonesia. The various stages of research encompass the initial discussion surrounding the development of an idea, the formulation of proposals and research protocols, the attainment of ethical permission, the synthesis of existing secondary data through survey findings, the analysis and processing of collected data, the compilation of research reports, and the eventual publication of the study findings.

The participants involved in this research were residents belonging to two regencies, located in the Central Kalimantan Province, Indonesia. These individuals voluntarily participated in health education activities. The selection of participants will be conducted using a non-probability sampling approach, specifically employing the consecutive sampling technique. The data utilized in this study consist of posttests data collected from persons residing in Central Kalimantan who participated in an educational program and completed both the immediate posttest (Post-1) and 3-months-after-education posttest (Post-2). This study focuses on question theme regarding daily dietary intake of animal protein among participants to prevent stunting by assessing its contribution to essential nutrient intake required for healthy growth.

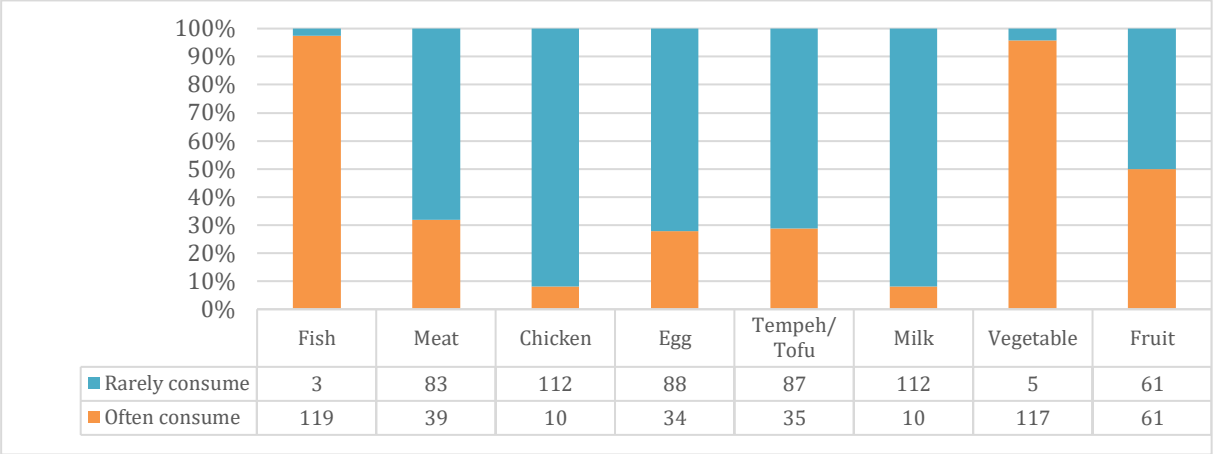
No intervention was conducted in this study as it relied on secondary data sources. The Indonesian Gastronomy Community (IGC) engages in health education programs. Health education was administered by doctors and nutrition experts. Health education is conducted in a synchronized manner, occurring once for every district. As permitted by IGC, the researcher compiled the secondary data obtained from the IGC poll into Microsoft Excel. The subsequent analysis of the recapitulation results involves a thorough selection procedure that

takes into account specific criteria for inclusion and exclusion, as well as thorough data cleaning. The findings will be subjected to descriptive analysis and further examined in conjunction with prior research or pertinent scholarly literature.

The data processing methods employed in this study encompass various stages, namely editing, coding, processing, and cleaning. The data derived from secondary sources, specifically questionnaire responses, will be compiled with the Microsoft Excel software. Subsequently, the process of data cleaning is undertaken, specifically encompassing the verification of consistency. This entails scrutinizing data points that fall outside the expected range, exhibit logical inconsistencies, display extreme values, or contain undefined values. Following the rules set forth by the Agency for Healthcare Research and Quality (AHRQ), incomplete data entries and questionnaires that solely contained demographic information or uniform responses across all questions were omitted from the analysis. These exclusions were made on the basis that such data did not adequately reflect the perceptions of the respondents. The generated data is subsequently subjected to statistical analysis using the SPSS software. The analysis will be conducted using descriptive and bivariate methods.

Results

A total of 152 post-1 survey and 122 post-2 survey voluntarily filled by the participants are further analyzed. The survey composed of open-ended questions printed on a paper and filled by the participants onsite with a pen.



	Fish	Meat	Chicken	Egg	Tempeh/ Tofu	Milk	Vegetable	Fruit
Rarely consume	3	83	112	88	87	112	5	61
Often consume	119	39	10	34	35	10	117	61

Figure. 1. Participants daily diet

The post-2 survey questioned participants' daily diet (Figure 1). Among 122 respondents, their diet consists of fish (97.54%), vegetable (95.90%), fruits (50%), meat (31.97%), tempeh/tofu (28.68%), egg (27.87%), chicken (8.19%), and milk (8.19%), in descending order.

Another question aimed to understand participants' consumption of animal-based protein both at home and outside in post-2. Participants were asked *"Dalam 1 bulan terakhir ini, berapa kali makanan di bawah ini yang anda konsumsi sebagai menu makanan di rumah atau diluar rumah? (*score: 0 = *tidak pernah,* 1 = *sebulan sekali,* 2 = *seminggu sekali,* 3 = *setiap hari)"* that means "In the last 1 month, how many times have you consumed the following foods as part of your meal at home or outside home? (score: 0 = never, 1 = once a month, 2 = once a week, 3 = every day)". The 6 food choices participants needed to answer are chicken/ duck, cow's/ goat's meat, fish, shrimp/ squid, egg, and milk. The average score for animal-based protein consumption at home were as follows: eggs (2.65), fish (2.60), milk (1.82), chicken/duck (1.82), shrimp/squid (1.49), and cow's/ goat's meat (0.81), respectively from most to least frequent. For consumption outside the home, the averages scores were fish (1.30), eggs (1.19), chicken/duck (1.18), milk (0.95), shrimp/ squid (0.83), and cow's/ goat's

meat (0.55).

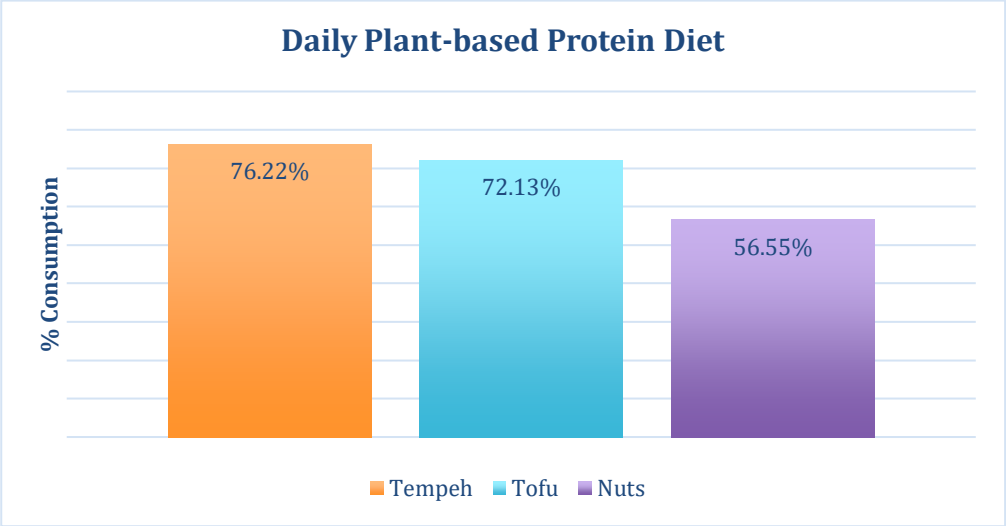


Figure. 2. Daily plant-based protein

Shown in Figure 2 are daily plant-based protein of the participants from post-2. From highest to lowest rate of consumption are tempeh (n = 93/122; 76.22%), tofu (n = 88/122; 72.13%), nuts (n = 69/122; 56.55%).

Analysis comparing the scores of post-2 and post-1 revealed a decline in participants' total scores in five out of six questions over a period of three months. The proportion of incorrect answers rises from 36 out of 912 (3.94%) in post-1 to 86 out of 732 (11.74%). This data is derived from the total number of incorrect responses provided by each respondent across all questions answered. The most frequently answered incorrectly is the question, "Are fish, clams, and seaweeds rich in protein?".

Discussion

Stunting is a concerning issue, since it can have long-term consequences on child's physical and cognitive development.[8] One of the direct factors of stunting is food intake.[9] Being

dependent to their parents as caretaker, children's eating habit are influenced by their parents. Parental food habits and opinion are the role-model for their children dietary habit. Parents can be a positive role model to encourage good eating habit by exposing their children with variety of food choices, taste, and flavours especially during their early-life experiences.[10] Geographical aspect also influence the food choices by affecting the food availability.[11]

To provide adequate nutrition intake in pre-pregnancy, pregnancy, and children are the management strategies to prevent stunting in children. Almost all of this study participants often consume fish in their diet. This was further confirmed by an additional question, where participants indicated that fish is frequently consumed both at home and outside. Fish is a good source of protein and often recommended as stunting prevention program in Indonesia.[12] This aligns with findings that Central Kalimantan is included in the cluster with the highest level of fish consumption by Virgantari, et al, along with South Kalimantan, East Kalimantan also North Kalimantan.[13] Central Kalimantan also has a wide variety of fish species, most of which are consume fish.[14]

Figure 1 also shows that most of participants also consume vegetables. This aligns with the data from Badan Pusat Statistik (BPS), indicating that Central Kalimantan produces various agricultural products, such as mustard greens, spinach, eggplant, tomatoes, chilies, long beans, chayote, green beans, cucumbers, water spinach, and spring onions.[15]

The primary sources of plant-based protein of participants are mainly tempeh and tofu (Figure 2), variety of food derived from soybeans. More than half of participants also consume nuts and its products. Tempeh and tofu are also a plant-based protein source made from soybeans that widely available and affordable in Indonesia.[16] Utilization of local food as

stunting prevention is an important step to decrease stunting in children. Local food have high availability, relatively inexpensive, and also often integrated with the population's culture.[17]

On of the key strategies for preventing stunting is education. Education in this context should ideally go beyond mere information dissemination. It should be behavior-focused, aiming to instill long-term dietary habits that ensure adequate nutrient intake across all food groups and life stages. For instance, while high fish consumption may suggest good access to animal protein, the persistence of high stunting rates implies that other contributing factors. This highlights the need for a more holistic, habit-forming approach to nutrition education, one that emphasizes not only what foods to consume, but also how often, in what combinations, and within what broader lifestyle and health practices. Such an approach is crucial to effectively translate animal protein intake into measurable improvements in child growth and development outcomes. However, several factors need to be considered, such as parent's socioeconomics and education.[10] The retention of knowledge by individuals is also crucial and should also be considered, which is why repetitive training should be incorporated into the prevention program. Repetitive education about local food and its nutritional value is essential for local residents. Past studies indicate that repeating education sessions at least three times is necessary for long-term retention. Future studies should consider incorporating strategies such as the blocking method, spacing method, and rereading to enhance long-term retention.[18,19,20]

In cases where stunting needs to be treated rather than prevented, further medical intervention is required. Additional nutritional interventions, such as food for special medical purposes (FSMP), may be provided by health practitioners, as mentioned in the stunting

guidelines by Ministry of Health.[21] Adequate protein intake, particularly from animal sources, is critical in supporting optimal growth and preventing stunting among children. However, addressing stunting involves more than just nutrient availability; it requires a comprehensive and coordinated approach. Sentika *et al.* (2024) emphasize the importance of interprofessional collaboration (IPC) in stunting management in Indonesia, highlighting that nutritional interventions are more effective when aligned with systematic guidelines and integrated across health sectors.[22] Moreover, Sundjaya *et al.* (2024) reveal that alterations in the gut microbiome among undernourished and stunted children under two years of age may impair nutrient absorption, including proteins, which further exacerbates growth deficits despite dietary intake. This suggests that biological factors can modulate the effectiveness of protein consumption.[23] Additionally, Basrowi *et al.* (2024) found that maternal perspectives and trust in community-based health services (Posyandu) significantly influence early nutrition practices.[24] Strengthening maternal engagement and trust in these services could enhance compliance with dietary recommendations, including regular animal protein intake. Together, these findings underline that while sufficient protein is vital, its impact on stunting is interlinked with systemic health delivery, gut health, and community-level engagement.

Conclusion

Residents of Central Kalimantan Province in Indonesia primarily rely on fish, tempeh, and tofu as their main protein sources. These foods are high in protein and readily available in their local environment. To aid in stunting prevention, regular educational programs should be implemented to ensure long-term retention of knowledge.

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Conflict of Interest and funding disclosure

All author declares no conflict of interest.

Author contributions

D.P., H.M. and R.W.B. involved in conceptualization, D.P. and E.K. writing the original drat preparation, D.P., E.K., H.M., and R.W.B. writing review and editing manuscript. All authors have read and agreed to published version of manuscript.

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