

Early Detection for Malnutrition Risk Children with STRONG Kids: A Systematic Review

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ABSTRACT

Introduction: The fulfilment of nutrition, especially in children, has a very crucial impact on their growth and development in the future, besides the fulfilment of good nutrition also supports the achievement of child health and can prevent diseases that can worsen the child's condition. Healthy children are the hope for the development of the country in the future, especially in achieving the Golden Indonesia 2045. This literature review aims to discuss the effectiveness of early detection of malnutrition risk in children using the STRONG Kids screening tool

Methods: The study was conducted using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) analysis. The keywords used were early detection, children, malnutrition and STRONG Kids. Data was generated from 10 journals that have been obtained from a total of 106 journals obtained by the journal search method using the Sage Journal database and google scholar.

Results: The results showed that the STRONG Kids screening tool can provide an early picture in the early detection of suspected malnutrition risk in children aged 1 month to 18 years. STRONG Kids screening is effective and can be used as one of the screening tools in detecting children with suspected malnutrition risk.

Keywords: *Malnutrition Risk; Children; STRONG Kids*

Introduction

Children are the hope of every family, community and country. Indonesia has a target of Golden Indonesia 2045, one of the indicators of which is human development (*Indonesia Emas 2045*, n.d.). Efforts to improve child nutrition must start early to facilitate human development in accordance with SDG's indicators in an effort to realise a healthy and prosperous society (*SDGs Adalah Pokok Penting Acuan Mencapai Indonesia Emas 2045*, 2023). The nutritional status of children is influenced by various factors, including the economy, the mother's knowledge about nutrition and others (Maharani et al., n.d.). A child's good nutritional status will make it easier for the child to carry out daily activities and not be easily infected by infectious diseases or malnutrition.

Malnutrition that occurs both in the world and in Indonesia is still very high and this can be seen from the high morbidity rates in children (Suchiyanti, 2023). The risk of malnutrition that is not addressed quickly and appropriately will also result in growth delays such as stunting (Indonesiana et al., 2024). The problem of lack of nutrition, especially among children in Indonesia, in 2022 through the Indonesian Nutrition Status Study (SSGI) was recorded at 1 in 5 children in Indonesia experiencing stunting (Suchiyanti, 2023). The problem of malnutrition will also have an impact on the health status of children so that they will be susceptible to several infectious diseases including pulmonary TB, pneumonia, diarrhea and others (Riska Nur Suci Ayu & Rahmayati, 2023), Apart from that, it also has an impact on cognitive development disorders, causing delays in children's development (Liansyah, 2015).

Research conducted by Vike Dwi Hapsari et al in 2020 shows that the use of STRONG Kids screening can be used to detect early children at risk of malnutrition in toddlers with diarrhea (Hapsari et al., 2022). Another study that also used the STRONG Kids early detection tool was conducted by Dewa Ngakan Putu Yogi et al who explained that the use of the STRONG Kids screening tool combined with anthropometric measurements can be used for early detection of malnutrition in children in hospitals (Yogi Astika, 2021). Another study conducted by Riska Nur Suci Ayu and El Rahmayati used STRONG Kids screening to detect the level of malnutrition in

children with active pulmonary TB and suspected pulmonary TB (Riska Nur Suci Ayu & Rahmayati, 2023). The incidence of malnutrition can actually be detected early by local health workers, either at the primary level through the Community Health Center or at the Prevention Posyandu by carrying out early detection through body weight, height and BMI assessment. However, if the child is already sick, before it goes into a more worrying direction, things that health workers can do include early detection of the child's condition using STRONG Kids (Screening Tools for Risk on Nutritional Status and Growth) (Yogi Astika, 2021).

This literature review aims to identify using the STRONG Kids screening tool to identify the effectiveness of early detection in assessing the risk of nutritional disorders in children so that health workers can take quick and appropriate steps in efforts to treat them in the future.

Methods

Study Design

The study was conducted using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) which was carried out systematically by following the correct research stages or protocols. The procedure for this systematic review consists of several steps, namely 1) compiling the background and objectives; 2) Research questions; 3) Searching for the literature; 4) Selection criteria; 5) Practical screen; 6) Quality checklist and procedures; 6) Data Extraction strategy.

Inclusion Criteria

The inclusion criteria for this literature review were as follows: 1) Fulltext articles; 2) English and Indonesian; 3) Published in 2017-2024; 4) The type of research design in the article is cross sectional/prospective study; 5) The research topic is early detection of malnutrition risk in children with the STRONG Kids screening tool. The number of sources obtained from databases including Google scholar 106 and Sage Journal 10 with research conducted is screening children using STRONG Kids.

Source Article

The two main electronic databases used for identification of relevant sources were Google Scholar and Sage Journals published from 2017-2024.

Search Strategy

The researcher also scanned the reference list to match the citations related to the research objectives. The database search was conducted from 1-5 November 2024. The keywords used were: ‘Malnutrition Risk’, ‘Child’ and ‘STRONG Kids’.

Article Selection

Articles were screened based on inclusion and exclusion criteria. The flow of article screening is presented in Figure 1 below.

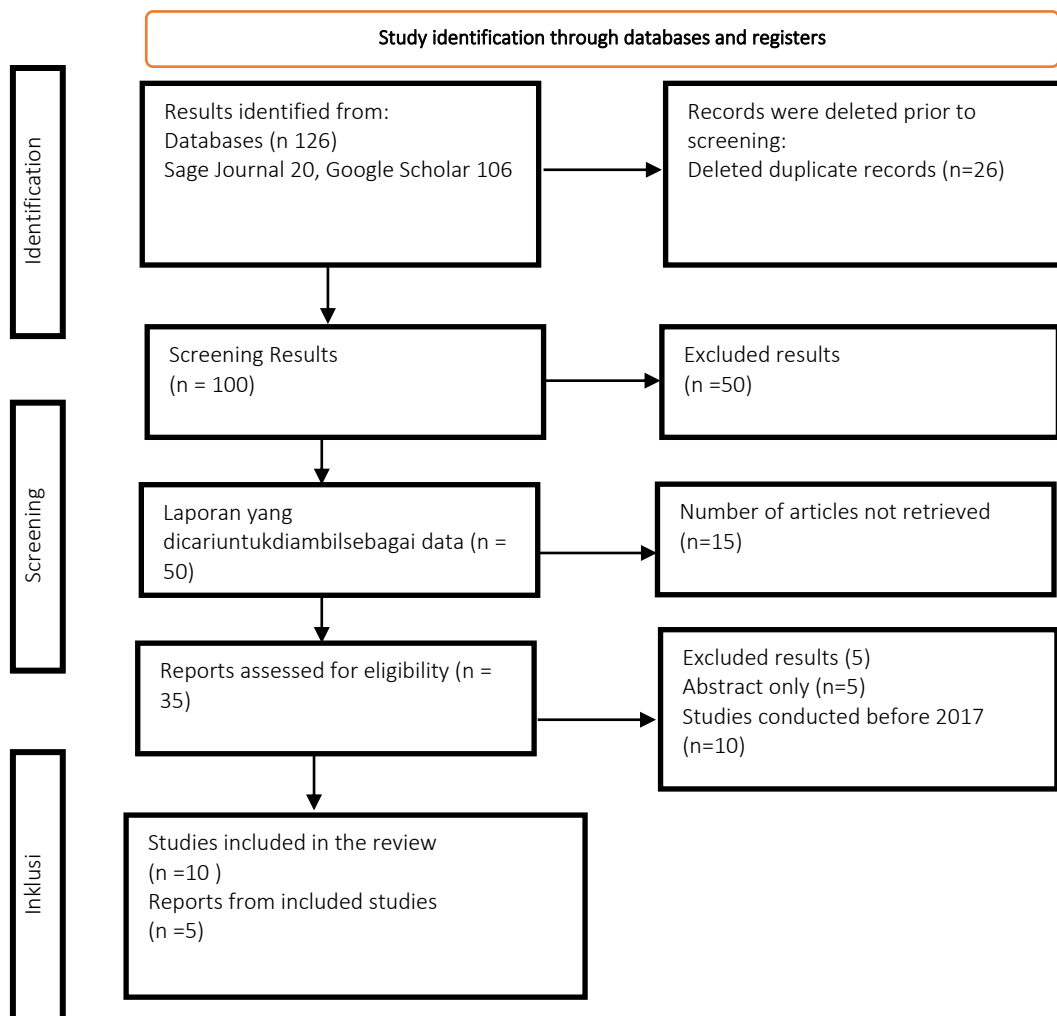


Figure 1. Study identification through databases and registers

Data Extraction

Each journal was extracted separately. Parameters were extracted from each research journal such as title, author, venue, total sample, Variables studied, Research Design, Year of publication and Results.

Result

This research resulted in 10 journals identified based on the inclusion criteria used:

Table 1. Journals Identified Based on the Inclusion Criteria

No	Title	Author	Place	Sample	Variable	Study Desain	Year	Result
1	Toddler Malnutrition Risk Screening using STRONG Kids	Rahayu Maharani (Maharani, 2023)	North Jakarta	74	Malnutrition Risk STRONG Kids	Descripti on	2023	Medium until High (23%) Not Risk (77%)
2	Screening for Malnutrition and the Effect using the STRONG Kids Aplication on Increasing Mother's Knowledge and Children's Eating Behavior	Rahayu Maharani Nyimas Heni Purwati and Tria Astika Endah Permatasari (Maharani et al., n.d.)	Koja	71	Demographi c data (Age, Gender child, education) and Screening malnutrition with STRONG Kids	Cross-Sectional	2024	P value < 0,05 significant difference with an AUC value of 50%
3	Detecting Undernutrition on Hospital Admission-Screening Tool Versus WHO Criteria	Duška Tješić-Drinković, Irena senecic-calaet all (Matak, 2017)	Universit y Hospital Center Zagreb	124	BMI, Age, z-score, and STRONG Kids	Prospecti ve Observat ional Study	2017	KW Test: 69,1 There was significant difference among BMI and risk group by STRONG Kids
4	Early Detection Of Malnutrition Risk in Children with Tuberculosis Using Screening Tools: STRONGkids	RiskaNurSuciAyu and El Rahmayati (Riska Nur Suci Ayu & Rahmayati, 2023)	Central Lampung	354	Age, Gender, Immunisatio n status of BCG and Status STRONG Kids	Cross-sectional	2023	Low Risk 5% Medium Risk 70% High Risk 25%

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5	Early Detection of Undernutrition Risk in Children Under Five with Diarrhoea Using the PYMS and STRONG Kids	Vike Dwi Hapsari, Nyima Heni Purwaty and Titi Sulastri (Hapsari et al., 2020)	Tangerang	40	Demographic data, Data PYMS, Data STRONG Kids, Data SGNA	Cross-sectional	2022	STRONG Kids has lower sensitivity and specificity were lower than those by PYMS
6	Accuracy of STRONGKids to Identify Risk of Children Malnutrition in Sanjiwani General Hospital Gianyar, Bali	Dewa Ngakan Putu Yogi Astika, Putu Triyasa and Rima Kusuma Ningrum (Yogi Astika, 2021)	Gianyar	41	Gender, Age, Nutrition status, STRONG Kids Score	Cross-sectional	2021	After analyzing the sensitivity and specificity according to the formula, the results showed that the STRONGKids sensitivity was 100%, and the specificity was 35.1%. The sensitivity of STRONGKids was very high, while the specificity was quite low
7	Effectiveness of Early Detection of Malnutrition in Children aged 6-29 Months using Android-Based Application	Suhaela Aro'fah and Selamat Budiman (Aro'fah & Budiman, 2023)	Jambi	57	Age, family history, salt intake, obesity, dyslipidemia, gender, smoking habits, alcohol consumption	RnD	2023	analysis results in the target group 54% respondents stated the effectiveness of using this application is very good to use, and 42% stated that it was good to use, 4% stated moderately
8	Comparison of Nutritional Screening STRONG Kids and PYMS in	Laurentia Raina Indonesia, Susetyowati,	Center Java	54	Demographic data, Data PYMS, STRONG Kids and	Cross-sectional	2022	PYMS exhibited higher sensitivity, specificity,

	Detecting the Risk of Malnutrition in Pediatric Cancer Patients at Dr. Sardjito Hospital	<i>et all</i> (Indonesiana et al., 2024)			SCAN Data			and AUC compared to STRONGkids (89.1%, 88.2%, 0.925 (0.885-0.996) respectively)
9	STRONG Kids Validation: Tool Accuracy	Juliana Rolim Viera Maciel, Eduardo Yoshio Nakano <i>et all</i> (Rolim et al., 2020)	Brazil	271	Gender, Nutritional risk, and STRONG Kids Status	Cross-sectional	2020	Validation of the accuracy of STRONGkids was performed, showing high sensitivity
10	The Performance of STRONG Kids in the Early Detection of Hospital Malnutrition	Tommy, Herlina Dimiati, Mars Nasrah Abdullah <i>et all</i> (Tommy et al., 2022)	Banda Aceh	75	Gender,	Cross-sectional	2022	STRONG Kids tools effective in identifying risk hospital malnutrition

Discussion

A child is someone whose age is 1 month to 18 years old, the growth and development of children in early life is highly dependent on the family who cares for them (Maharani et al., n.d.). Children are not miniature adults, children are unique souls who have uniqueness in every period of growth and development (Apriliawati & dkk, 2020), good growth and development must be accompanied by adequate nutrition (Negeri et al., 2024). Children aged 1 month to school age are susceptible to diseases such as pulmonary tuberculosis, diarrhoea, pneumonia, obesity, malnutrition, impaired growth and development and other serious diseases that affect the child's future.

The management of children who are being treated in the hospital to detect the risk of malnutrition is one of them by conducting early detection screening which can be done with the STRONG Kids (Screening Tool for Risk on Nutritional Status and Growth) instrument which is easy and has a good level of sensitivity for early detection (Rolim et al., 2020).

The STRONG Kids instrument (18) consists of 4 questions with scores and scoring methods in the following table:

Table 2. Instrumens the STRONG Kids

Screening Risk of Malnutrition Asses Following items < 24 H after admission and once a week thereafter	Score → Poin	
1. Is there an underlying illness with ris for malnutrition (see list) or expected major surgery?	No	Yes (2)
2. Is the patient in a poor nutritional status judged with subjective clinical assessment: loss of subcutaneous fat and/or loss of muscle mass and/or hollow face?	No	Yes (1)
3. Is one of the following items present? a. Excessive diarrhoea (≥ 5 per day) and/ or vomiting (> 3 times/ day) during the last 1-3 days b. Reduced food intake during the last 1-3 days c. Pre-existing nutritional intervention (e.g. ONS or tube feeding) d. Inability to consume adequate nutritional intake because of pain	No	Yes (1)
4. Is there weight loss (all ages) and/or no increase in weight/height (infants < 1year) during the last few week-months?	No	Yes (1)

Maximum total score: 5

Diseases with risk of malnutrition (item 1)		
<ul style="list-style-type: none"> - Psychiatric eating disorder - Burns - Bronchopulmonary dysplasia (up to age 2 years) - Celiac disease (active) - Cystic fibrosis - Dysmaturity/prematurity (until corrected age 6 months) - Cardiac disease, chronic - Infectious disease - Inflammatory bowel disease - Cancer 	<ul style="list-style-type: none"> - Liver disease, chronic - Kidney disease, chronic - Pancreatitis - Short bowel syndrome - Muscle disease - Metabolic disease - Trauma - Mental handicap/retardation - Expected major surgery - Not specified (classified by doctor) 	
Risk of malnutrition and need for intervention		
Score	Risk	Intervention and Follow-up
4-5 Points	High Risk	1. Consult doctor and dietician for full diagnosis and individual nutritional advice and follow-up. 2. Check weight twice a week and evaluate nutritional advice

		3. Evaluate the nutritional risk weekly
1-3 Points	Medium Risk	1. Consider nutritional intervention 2. Check weight twice a week 3. Evaluate the nutritional risk weekly
0 Points	Low Risk	1. No nutritional intervention necessary 2. Check weight regularly (according to hospital policy) 3. Evaluate the nutritional risk weekly

Research conducted by Tommy, Herlina Dimiati, Mars Nasrah Abdullah *et al* (Tommy et al., 2022) showed that the STRONG Kids instrument has good sensitivity in identifying malnutrition in hospitalised children. Another study conducted by Zrinka Matak, Duska Tjesic-Drinkovidet *all* (Matak, 2017) showed that the STRONG Kids instrument can detect the nutritional status of children in hospitals. Other studies that show that the STRONG Kids instrument has the ability to detect early nutritional status were conducted by Juliana Rolim Vieira Maciel, Eduardo Yoshio Nakano *et al* (Rolim et al., 2020) showed that the STRONG Kids instrument has a high sensitivity in early detection of nutritional risk status in children.

Conclusion

Based on the literature study above, it can be concluded that STRONG Kids has good sensitivity in detecting the risk of malnutrition in children and can be used in hospitals and basic health services such as health centres and posyandu.

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