

Nutritional risk screening of hospitalized children based on STRONGkids tool at a tertiary care center

Kayastha P,¹ Lekhak PP,² Basnet S,² Kafle S,¹ Shrestha AL³

¹Pawana Kayastha, ¹Sagar Kafle, Department of Paediatrics; ²Prabineshwar Prasad Lekhak, ²Smriti Basnet, Kathmandu Medical College; ³Ashish Lal Shrestha, Department of Paediatric Surgery, Kathmandu Medical College Teaching Hospital, Sinamangal, Kathmandu, Nepal.

ABSTRACT

Introduction: Malnutrition is a common but often under-recognized problem among hospitalized children, associated with adverse clinical outcomes and prolonged hospital stays. Early identification of nutritional risk using validated screening tools is essential for timely intervention.

Objectives: To determine the nutritional risk status of hospitalized children in Nepal using the STRONGkids tool and to correlate risk scores with anthropometric status and length of hospital stay.

Methodology: A prospective hospital-based cross-sectional study was conducted from March 2024 to March 2025 among 211 children aged \geq one month to 16 years admitted to pediatric and pediatric surgery wards at Kathmandu Medical College. Nutritional risk was assessed using the STRONGkids tool within 24 hours of admission, and anthropometric evaluation was performed using WHO growth standards.

Results: Among the study population, 16 (7.6%) children were at high risk, 89 (42.2%) at moderate risk, and 106 (50.2%) at low risk of malnutrition. Anthropometric assessment showed 27 (12.8%) were stunted, 24 (11.4%) wasted, 23 (10.9%) underweight. A significantly positive correlation was found between STRONGkids score and hospital stay (Pearson's $r = 0.181$, p value = 0.008).

Conclusion: The STRONGkids tool is effective in detecting both acute and chronic nutritional risks in hospitalized Nepalese children. Routine use of this tool may enable early identification and timely intervention, potentially reducing the burden of malnutrition in hospitalized children.

Keywords: Hospitalized children; Malnutrition; Nepal; STRONGkids

Access this article online

Website: www.jkmc.com.np

DOI: <https://doi.org/10.3126/jkmc.v14i52.94891>

HOW TO CITE

Kayastha P, Lekhak PP, Basnet S, Kafle S, Shrestha AL. Nutritional risk screening of hospitalized children based on STRONGkids tool at a tertiary care center. *J Kathmandu Med Coll.* 2025;14(2):54-58.

Submitted: Sep 17, 2025

Accepted: Mar 18, 2026

Published: May 25, 2026

Address for correspondence

Dr. Pawana Kayastha
Associate Professor,
Department of Paediatrics,
Kathmandu Medical College Teaching Hospital, Kathmandu
Nepal
E-mail: paw_ana@hotmail.com

Copyright © 2025 Journal of Kathmandu Medical College (JKMC)

ISSN: 2019-1785 (Print), 2091-1793 (Online)



This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.

INTRODUCTION

The prevalence of malnutrition in hospitalized children is between 6.1 to 50% worldwide.¹ It is associated with longer hospitalization stays, multiple interventions, readmission and higher susceptibility to infections leading to significant morbidity and mortality.²

Current nutritional status and the risk of deterioration secondary to increased requirement caused by metabolic stress associated with the clinical condition is nutritional risk.³ Assessment of patients' actual nutritional status only identifies those who are already malnourished, while early identification of children at risk for malnutrition could promote timely nutritional interventions. So, screening nutritional status to identify malnourished children early is very important. The STRONGkids is a paediatric nutrition screening tool developed in a Dutch population of pediatric patients⁴ and was successfully applied in Netherland and many other countries⁵ however in Nepal it has not been used.

Since 2005, the European Society of Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) also recommends the implementation of nutritional screening strategies to establish individualized nutritional plans in order to improve pediatric care, thus reducing the incidence of nutritional deficiencies and under nutrition during hospital stays.⁶

This study aims to identify nutritional risk status of hospitalized children based on STRONGkids tool and correlate with actual nutritional status.

METHODOLOGY

A hospital based cross-sectional study was conducted, from March 2024 to March 2025 among children admitted in pediatric and pediatric surgery wards of Kathmandu Medical College. All the patients admitted in the pediatric and pediatric surgery wards from March 2024 to March 2025 were included. The study was done among children of age one months to 16 years and hospital stay of at least 1 day. Patients who were admitted to intensive care or admitted for less than 24 hours in ward or for whom anthropometric measurements (weight, height) could not be obtained or refused to participate were excluded. STRONGkids Nutrition screening was applied to enrolled patients within 24 hours of admission. Anthropometric evaluation at admission was determined using WHO growth standard. The cases were taken by consecutive sampling technique. The sample size derived was 211 with the use of formula; Sample size, $n = Z^2pq/e^2 = 210.68 \approx 211$

$Z = 1.96$ at 95% confidence; $p = 0.836$ (prevalence of medium to high nutrition risk was 83.6% taken)⁷; $q = 1 - p = 0.164$; $e = 0.05$ (5% margin of error).

Data were collected by using predesigned Proforma. The proforma consisted of three groups of questions: the first was about demographic questions, the second to record anthropometric measures and the third to score the risk for malnutrition using a nutritional risk screening tool (STRONGkids). The STRONGkids consists of 4 items (1- high risk underlying disease, 2- clinical assessment, 3- nutritional intake and presence of vomiting or diarrhea, 4- recent weight loss). On the basis of obtained score children were classified in one out of three classes for malnutrition (low, moderate, high risk) according to a specific 5-points scale (low = 0, moderate = 1–3, high = 4–5).⁸ The conditions that can lead to nutritional risk listed in the STRONGkids. The conditions that can lead to nutritional risk were listed in the STRONGkids are: anorexia nervosa, congenital heart diseases, celiac disease, expected major surgery,

dysmaturity/prematurity, bronchopulmonary dysplasia (maximum age 2 years), cystic fibrosis, digestive fistula, inflammatory bowel disease, infectious disease, metabolic disease, cancer, pancreatitis, chronic liver disease, muscle disease, chronic kidney disease, mental handicap/retardation, sepsis, short bowel syndrome, trauma, burns, other (specified by physician).³ Data on age, sex, diagnosis on admission, and length of stay were collected using a structured questionnaire after informed consent was obtained from caregivers of patients. Assent was also obtained from children who were seven years and older. Anthropometric measurements were measured following a standardized protocol. Nutritional status at admission was determined using WHO growth standard with weight-for-height, weight for age and weight for height criteria. The STRONGkids screening tool were used to screen for the risk of malnutrition. Data included patient's age, gender, diagnosis of the diseases, nutritional status and a score of the STRONGkids and were collected at the same time at admission. Validation of accuracy of STRONGkids shows, Sensitivity 84.8%, specificity 26.7%, positive predictive value 49.8%, negative predictive value 67.2%. It shows high sensitivity allowing the early identification of nutritional risk in similar populations.⁹

Ethical approval was taken from the Institutional Review Committee (Reference number: 12082024/02) of Kathmandu Medical College Teaching Hospital, Kathmandu, Nepal.

RESULTS

Out of 211 children enrolled, 170 (80.6%) of the children were below five years old and 41 (19.4%) were above five years old. The mean age was 3.028 ± 2.69 years. 84 (39.8%) were female, and 127 (60.2%) were male. The mean weight and height of the enrolled children were 13.46 ± 7.57 kg and 90.35 ± 23.07 cm respectively.

The average duration of hospital stay was 5.21 ± 3.46 days. The maximum duration of hospitalization was 20 days, with a median of 4 days. Among the enrolled children, most common cause of admission was respiratory illness, 111 (52.6%). This was followed by 40 (19.0%) with neurological illness, 31 (14.7%) with gastrointestinal problems, 14 (6.6%) with infectious diseases, 6 (2.8%) with genitourinary problems, 1 (0.5%) with cardiac illness, and 8 (3.8%) with other illnesses.

Among the study population, nutritional risk status was identified as 16 (7.6%) in high-risk, 89 (42.2%) in moderate risk and 106 (50.2%) in low-risk category according to STRONGkids screening tool score.

Anthropometric evaluation of the total population showed that 27 (12.8%) were stunted, 24 (11.4%) were wasted, 23 (10.9%) were underweight.

A statistical analysis using the Chi-Square test was performed comparing age group, gender, height for age, weight for height and weight-for-age in relation to STRONGkids score.

The above table shows that the age of children and anthropometric values have statistically significant association with STRONGkids nutrition risk status (p-value <0.05). A Pearson correlation analysis between the duration of hospital stay and STRONGkids score also showed Pearson's $r = 0.181$ and p-value 0.008 indicating statistically significant weak positive correlation (figure 1).

Table 1: Association of different variables with STRONGkids nutrition risk category

Variables	STRONG _{kids} nutrition risk category			p-value	
	high risk (%)	moderate risk (%)	low risk (%)		
Gender	Male	8 (50)	57(64.04)	62(58.49)	0.5
	Female	8(50)	32(35.96)	44(41.51)	
Age	≤5 Years	14 (87.5)	63 (70.79)	93 (87.74)	0.009*
	>5 Years	2 (12.5)	26 (29.21)	13 (12.26)	
Height for Age	Normal	8 (50)	79 (88.76)	97(91.51)	<0.001*
	Stunting Present	8 (50)	10 (11.24)	9 (8.49)	
Weight For Height	Normal	9 (56.25)	82 (92.13)	96 (90.57)	<0.001*
	Wasting Present	7 (43.75)	7 (7.87)	10 (9.43)	
Weight For Age	Absent	11 (68.75)	80 (89.89)	97 (91.51)	0.02*
	Underweight Present	5 (31.25)	9 (10.11)	9 (8.49)	

p – value significant at <0.05, *= Chi-square test

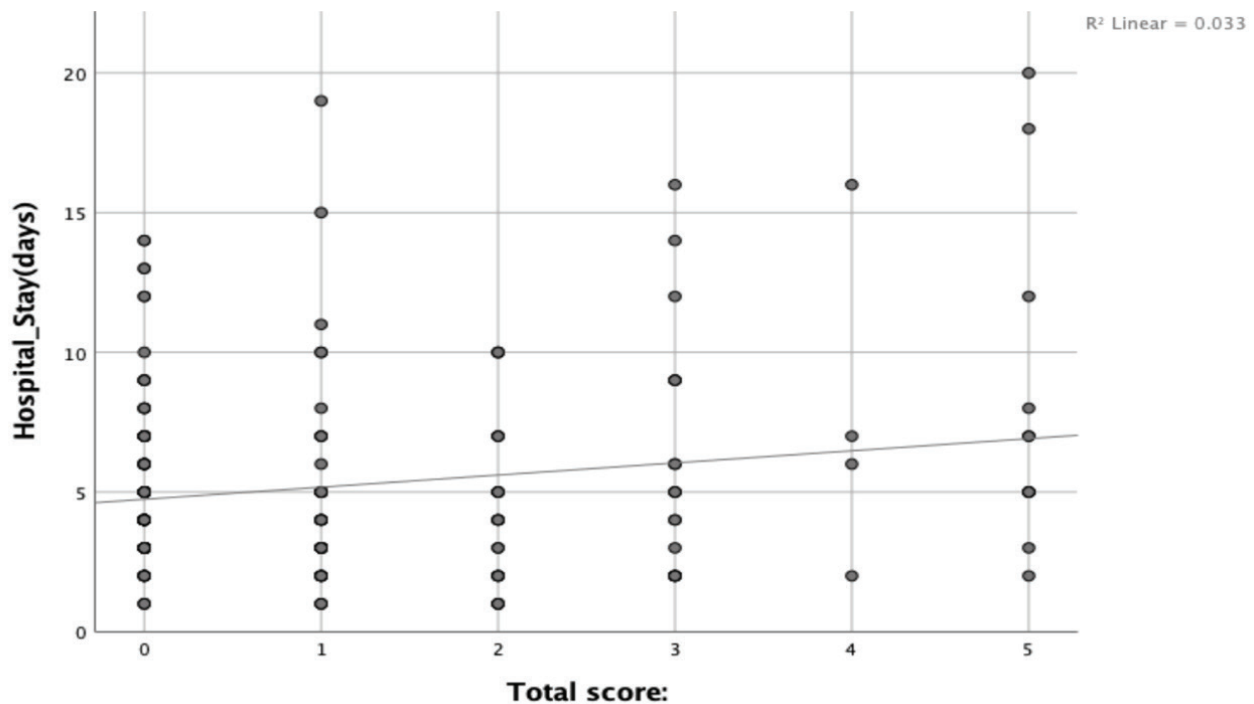


Figure 1: Relationship between STRONGkids score and length of hospital stay: A scatter plot with linear fit.

DISCUSSION

This study demonstrates that nearly half of hospitalized children fall into moderate or high nutritional risk categories. Research conducted in Cairo, Egypt, using the STRONGkids score, revealed that 37.8% of the patients were at high risk, 42.6% at moderate risk, and 19.6% at low risk.¹⁰ Similarly, in India, 11.7% of undernourished children were identified as high risk by the STRONGkids score.¹¹ A systematic review of the nutritional risk of the pediatric population by the STRONGkids score showed that the frequency of nutritional risk (medium or high) ranged from 35.7 to 100% globally.¹² The differences could be attributed to differences in population demographics, inclusion criteria, or hospital admission patterns. The prevalence of the moderate-risk population is similar in our settings compared to Cairo, Egypt. The moderate-risk group was substantial (42.2%), underscoring the importance of early screening to prevent escalation into severe malnutrition. Children under one year of age and those with chronic or complex conditions exhibited higher risk scores, supporting prior evidence that these groups are particularly vulnerable.

The STRONGkids tool correlated significantly with hospital stay, suggesting that higher nutritional risk is associated with prolonged hospitalization. This finding emphasizes the clinical utility of STRONGkids not only for early detection but also as a predictor of hospital outcomes. A cohort study in Brazil (n=641) reported that high-risk patients had a 52% lower likelihood of discharge compared to low-risk patients.¹³ Similarly, an Egyptian study observed a positive association between hospitalization duration and STRONGkids scores.¹⁰ A cross-sectional study in Turkey also found that the average length of hospitalization was notably longer in the high-risk group.¹⁴

The gender of child didn't show statistically significant role in determining nutritional risk in our study. Similar results have been reported in other studies, where no

significant differences in STRONGkids categories were found between boys and girls.¹⁴

A significant correlation was identified between age group and the STRONGkids score. Admitted children within the age group of five years or less exhibit a relatively higher probability of achieving a higher STRONGkids score compared to children exceeding five years. Cao et al. also mention similar findings to our study that infants (less than 1 year) had a higher risk of malnutrition compared to children aged more than 1 year.¹⁵ Increased vigilance and early nutritional assessment are thereby needed for the younger age group.

Similar to our study, Elbanoni et al also showed that children with moderate and severe stunting were diagnosed as high risk of malnutrition. A comparable finding was seen in the same study for wasting, which showed children diagnosed as moderate and severe wasting, respectively, had a high risk of malnutrition.¹⁶ A parallel analysis was found in our study with weight for age and STRONGkids, where 97 children (91.51%) of low-risk children had a normal weight for age.

Limitations of this study include its single-center design and relatively small sample size, which may limit generalizability. Multicenter studies with larger cohorts are needed to validate these findings further

CONCLUSION

The STRONGkids tool is effective in identifying nutritional risk in hospitalized Nepalese children and shows significant correlation with hospital stay. Routine use of this tool should be encouraged in pediatric wards to enable early detection, timely intervention, and prevention of hospital-acquired malnutrition.

Source (s) of Support: None

Conflict of Interest: None

REFERENCES

1. Anku EK, Adu-Amoah GH, Ainuson-Quampah J. Validity of STRONGkids and MUAC as nutritional screening tools for predicting acute malnutrition among hospitalized children in Accra, Ghana. *HSI Journal*. 2023;4(1):428-34. [[Full Text](#) | [DOI](#)]
2. Ling RE, Hedges V, Sullivan PB. Nutritional risk in hospitalized children: an assessment of two instruments. *e-SPEN, the European e-Journal of Clinical Nutrition and Metabolism*. 2011 Jun 1;6(3):e153-7. [[Full Text](#) | [DOI](#)]
3. Vieira Gonçalves L, Oliveira AG, Barracosa M, Antunes J, Pimenta J. Nutritional Risk and Malnutrition in Paediatrics: From Anthropometric Assessment to STRONGkids® Screening Tool. *Acta Med Port*. 2023 May 2;36(5):309-316. [[PubMed](#) | [Full Text](#) | [DOI](#)]
4. Hulst JM, Zwart H, Hop WC, Joosten KF. Dutch national survey to test the STRONGkids nutritional risk screening tool in hospitalized children. *Clin Nutr*. 2010 Feb;29(1):106-11. [[PubMed](#) | [Full Text](#) | [DOI](#)]
5. Malekiantaghi A, AsnaAshari K, Shabani-Mirzaee H, Vigh M, Sadatinezhad M, Eftekhari K. Evaluation

- of the risk of malnutrition in hospitalized children by PYMS, STAMP, and STRONGkids tools and comparison with their anthropometric indices: a cross-sectional study. *BMC Nutr.* 2022 Apr 21;8(1):33. [[PubMed](#) | [Full Text](#) | [DOI](#)]
6. Guarino A, Albano F, Ashkenazi S, Gendrel D, Hoekstra JH, Shamir R, Szajewska H; ESPGHAN/ESPID Evidence-Based Guidelines for the Management of Acute Gastroenteritis in Children in Europe Expert Working Group. European Society for Paediatric Gastroenterology, Hepatology, and Nutrition/ European Society for Paediatric Infectious Diseases evidence-based guidelines for the management of acute gastroenteritis in children in Europe: executive summary. *J Pediatr Gastroenterol Nutr.* 2008 May;46(5):619-21. [[Full Text](#) | [DOI](#)]
 7. Castro JDS, Santos CAD, Rosa COB, Firmino HH, Ribeiro AQ. STRONGkids nutrition screening tool in pediatrics: An analysis of cutoff points in Brazil. *Nutr Clin Pract.* 2022 Oct;37(5):1225-1232. [[PubMed](#) | [Full Text](#) | [DOI](#)]
 8. Spagnuolo MI, Liguoro I, Chiatto F, Mambretti D, Guarino A. Application of a score system to evaluate the risk of malnutrition in a multiple hospital setting. *Ital J Pediatr.* 2013 Dec 27;39:81. [[PubMed](#) | [Full Text](#) | [DOI](#)]
 9. Maciel JR, Nakano EY, Carvalho KM, Dutra ES. STRONGkids validation: tool accuracy. *J Pediatr (Rio J).* 2020;96:371-8. [[PubMed](#) | [Full Text](#) | [DOI](#)]
 10. Shaaban S, Nassar M, El-Gendy Y, El-Shaer B. Nutritional risk screening of hospitalized children aged < 3 years. *East Mediterr Health J.* 2019;25(1):18–23. [[Full Text](#) | [DOI](#)]
 11. Moeeni V, Walls T, Day AS. The STRONGkids nutritional risk screening tool can be used by paediatric nurses to identify hospitalised children at risk. *Acta Paediatrica.* [[PubMed](#) | [Full Text](#) | [DOI](#)]
 12. Dos Santos CA, Ribeiro AQ, Rosa COB, de Araújo VE, Franceschini SDCC. Nutritional risk in pediatrics by StrongKids: a systematic review. *Eur J Clin Nutr.* 2019 Nov;73(11):1441-9. [[PubMed](#) | [Full Text](#) | [DOI](#)]
 13. Santos CAD, Rosa COB, Franceschini SDCC, Firmino HH, Ribeiro AQ. Nutrition Risk Assessed by STRONGkids Predicts Longer Hospital Stay in a Pediatric Cohort: A Survival Analysis. *Nutr Clin Pract.* 2021 Feb;36(1):233–40. [[PubMed](#) | [Full Text](#) | [DOI](#)]
 14. Oruçoğlu B, İnanç N. Assessment of the STRONGkids screening tool: A cross-sectional study in Turkish children. *Clin Sci Nutr.* 2020 July 16;2(1):35–42. [[Full Text](#) | [DOI](#)]
 15. Cao J, Peng L, Li R, Chen Y, Li X, Mo B, et al. Nutritional risk screening and its clinical significance in hospitalized children. *Clin Nutr.* 2014 June;33(3):432–6. [[PubMed](#) | [Full Text](#) | [DOI](#)]
 16. Elbanoni OI, Elabbud HAY, Greiw AEH. Assessment of Nutritional Status of Hospitalized Children: A Comparison of STRONGkids and Anthropometry. *Ibnosina Journal of Medicine and Biomedical Sciences.* 2022 June;14(02):074–8. [[Full Text](#) | [DOI](#)]