South African Journal of Clinical Nutrition 2023; 36(1):8–12
https://doi.org/10.1080/16070658.2022.2035495

SAJCN
ISSN 1607-0658 EISSN 2221-1268

ARTICLE

Nursing practices associated with diagnosis of malnutrition in children under 5 years in West Rand District primary healthcare facilities

RP Dimo[a,b], TK Madiba[c*] and A Bhayat[c]

[a]*School of Health System and Public Health, University of Pretoria, Pretoria, South Africa*
[b]*Department of Health, West Rand Health District Council Area, Gauteng, South Africa*
[c]*Department of Community Dentistry, University of Pretoria, Pretoria, South Africa*
**Correspondence: thommy.madiba@up.ac.za*

Background: Despite improvement in child health outcomes, undernutrition in children aged under five years continues to be a major public health problem, contributing to childhood morbidity and mortality.
Objectives: The aim was to determine the knowledge and practice patterns used in the identification of malnutrition by nurses at PHC facilities. The attendance rates and the impact of in-house paediatric courses were also examined.
Design: An observational, descriptive, cross-sectional study was undertaken from June to September 2018.
Setting: The study was conducted at 36 primary healthcare clinics in the West Rand Health District Council Area, Gauteng, South Africa.
Subjects: All nurses working with children aged under five years in the study clinics.
Results: The response rate was 94% (49) with a mean age of 42.5 years (±9.7) with the majority (98%) being females. Nearly two-thirds (61%) of the participants had good knowledge, 33% had excellent knowledge and 6% had poor knowledge. The mean knowledge score was 20.3 (8–27, SD). The practice categories indicated that two-thirds of the participants (61%) displayed poor practices, and 21% had good practices whilst only 18% displayed best practices. The mean practice score was 4.5 (1.75, SD). There was no association between attendance at courses, knowledge scores and practice patterns.
Conclusion: Most participants had good or excellent knowledge around issues of malnutrition. There was poor attendance on courses and there was no association between knowledge and attendance on the courses. More than 60% of the nurses had poor practice patterns and there was no association between knowledge, attendance on courses and practice patterns.

Keywords: anthropometry, child health, delayed diagnosis, malnutrition, nursing practices

Introduction

Despite major improvements in health outcomes, undernutrition in children aged under five years is still a major global public health challenge.[1–3] Childhood undernutrition contributes to morbidity, mortality, impaired intellectual development, suboptimal adult work capacity and increased risk of diseases in adulthood.[1–4] Globally, it was reported that more than six million children aged under five years died in 2016 and half of those deaths were attributed to undernutrition.[5] Undernutrition is defined as a lack of proper nutrition caused by not having enough food containing substances necessary for growth and health and by other direct and indirect causes.[6]

The 2017 United Nations Children's Fund (UNICEF) report showed that the under-five mortality rate in South Africa dropped from 85 per 1 000 live births in 2002 to 42 per 1 000 live births in 2016.[3] The prevalence of stunting decreased from 52% in 1993 to 27% in 2016.[3] About 50% of all the children who were dying were HIV-positive, 34% had severe malnutrition and 30% were underweight.[3] The South African national development plan (NDP) aims to reduce maternal, infant and child mortality by targeting to reduce under-five child mortality from 56 to less than 30 per 1 000 live births.[7]

The South African NDP is broadly aligned with the United Nations' sustainable development goals (SDGs) with regard to combating malnutrition.[7–8] The global 2025 malnutrition targets are to reduce the number of children under 5 who are stunted by 40%, to reduce and maintain childhood wasting to less than 5% and to ensure that there is no increase in childhood obesity.[1] Other child health strategies in South Africa (SA) that are in place are the integrated nutrition programme (INP) and integrated management of childhood illnesses (IMCI).[9] As a result of these goals, the training of nurses in SA is strongly geared towards the diagnosis, management and treatment of malnutrition.

A study by Akugizibwe *et al*. reported that 35% of mortalities in hospitalised paediatric patients were either primarily or secondarily caused by malnutrition.[10] In addition, it showed that children who presented very late for the in-patient management of malnutrition had a mortality rate of 22% on the day of admission. The report also highlighted that between 45% and 83% of all malnutrition-related deaths occurred in the underweight or mild to moderate categories of weight-for-age guidelines.[10]

A lack of proper assessment by nurses, who are the first-line health workers, is partly responsible for the delayed diagnosis of acute and chronic malnutrition.[10] Studies have reported that height and weight measurements were not routinely done in clinics, which often resulted in children not being afforded the opportunity for accurate nutritional assessments and detection of malnutrition at an early stage.[4,10] The most cost-effective, reliable and commonly used methods for nutritional assessments are anthropometric measurements such as weight, height, mid upper arm circumference (MUAC) and triceps and biceps folds.[11] Measurements alone are not very useful and should be converted into indices. Anthropometric

measurements are calculated into indices and are expressed in terms of z-scores or standard deviation (SD).[12] The anthropometric indices need to be compared with the World Health Organization (WHO) reference growth chart in order to assess the nutritional status of the child.[11,12]

The Gauteng Health Department has introduced various courses for nurses working in the primary health care (PHC) facilities to improve their knowledge and to ensure that they utilise the best practices available. This also ensures that nurses are equipped to apply the most up-to-date assessments when dealing with children who could be malnourished. These workshops also ensure that nurses know what information must be recorded and where to record it in order to ensure appropriate diagnosis and treatment of malnutrition.

Several studies in African countries reported that incomplete anthropometric measurements resulted in delayed diagnosis of malnutrition.[4,9,10] However, little is known about the practice pattern related to delayed diagnosis of malnutrition in children aged under five years at PHC facilities in the West Rand District, South Africa.

The aim of this study was to determine the knowledge and practice patterns used in the identification of malnutrition by nurses at PHC facilities in the West Rand District. This study also sought to determine the attendance rates and the impact of in-house paediatric courses and to carry out an audit of the availability of essential equipment necessary for the diagnosis of malnutrition at PHC facilities.

Methods

An observational, descriptive, cross-sectional study design was used. The West Rand Health District comprises three sub-districts (Merafong, Rand West and Mogale) and all were included in the study. A total of 36 PHC clinics were selected using a random stratified method: 10 from the Merafong sub-district, 12 from the Rand West sub-district and 14 from the Mogale sub-district. The sample included all the nurses working with children aged under five years at 36 PHC facilities between June 2018 and September 2018. Although the ideal is to have two nurses allocated to provide child health services at each facility, one for consultations with children with minor ailments and the other to provide the expanded programme on immunisation (EPI) services, not all PHC facilities had two nurses. In total 16 facilities had tw2o and 20 facilities had only 1 nurse respectively. As a result, the total sample consisted of 52 nurses.

Data were collected using three different tools: a self-administered questionnaire for the knowledge, a checklist to determine the presence or absence of equipment required for the consultations and a checklist to observe the practices of the nurses during the consultations.

A self-administered, validated modified questionnaire[10] was used to collect information on the sociodemographic characteristics and the knowledge in relation to identifying malnutrition.

The ages of the participants were divided into three age categories: 25–35, 36–46 and > 47 years. To obtain the knowledge scores, participants were asked 19 questions on the aetiology of malnutrition, 7 on the clinical signs of malnutrition and 9 on the classification on the types of malnutrition, with the total number of questions thus being 35. The knowledge score was calculated by awarding all correct answers a score of one (1) and all incorrect answers zero (0). The maximum score was 35. The scores were divided into three categories: poor if the score was less than 17, good if it was between 18 and 25 and excellent if it was equal to or more than 26.

Attendance at child health and nutrition in-house training was assessed. The participants' attendance rates were evaluated to assess the impact on the knowledge and practice patterns.

Data on the clinical procedures carried out by the participants were obtained by observing the participants and using a checklist to tick each procedure conducted. These included the conducting of anthropometric measurements (height, weight, arm circumference) plotting into file, the physical assessment and the interpretation of these values with identifying malnutrition.

The practice patterns were defined as the taking and plotting of the anthropometric measurements in the relevant indicator in the Road to Health booklet. This included the height measurement in the height-for-age graph and the guidelines for assessment according to Macías and Glasauer.[13] The anthropometric measurements and the plotting amounted to eight practice patterns, namely:

- measuring the height;
- taking the weight;
- measuring the mid upper arm circumference (MUAC);
- calculating the weight for length;
- calculating the weight for age;
- calculating the height for age;
- recording these measurements and calculations in the patient's file;
- recording these measurements and calculations on the patient's Road to Health booklet.

The practice pattern score was calculated by adding up the number of practices that each nurse had completed. Each practice that was successfully done was awarded a score of 1, while if it was not done correctly or not done at all, this achieved a score of 0. Hence the scores ranged from 0 to 8 and were then divided into three categories: a score of 4 or less was classified as 'poor practices', a score of 5 and 6 as 'good practice' and a score of 7 or more as best practice.

Lastly, a check list was done to determine whether the following essential equipment was present or absent in each facility: tape measure, paediatric scale and length board.

Data analysis

Data were analysed using SPSS version 25 (IBM Corp, Armonk, NY, USA). Descriptive statistics were used to summarise the data using frequency tables, means with standard deviations, range and percentages. The chi-square test was used to evaluate the association between variables. The level of statistical significance was set at $p < 0.05$.

Results

There was a total of 52 nurses and all were invited to participate. Of these, 49 responded (94% response rate) and were included in the study The participants' age ranged between 27 and 59 years (mean 42.5; ±9.7); 98% were female and 98% were professional nurses (Table 1).

Table 1: Demographics of the study participants ($n = 49$)

Characteristics/variable	n^a	%
Age:		
25–35	15	32
36–46	12	25
≥ 47	20	43
	47	100
Gender:		
Females	48	98
Male	1	2
	49	100
Years of experience:		
Less than 5	20	48
5 years and more	28	52
	48	100
Professional category:		
Professional nurses	48	98
Enrolled nurse	1	2
	49	100

[a]Total number may differ due to missing data.

Almost two-thirds (61%) of the participants fell within the 'good' knowledge category and 33% in the 'excellent' category. The mean knowledge score was 20.3 (8–27, SD).

Although not significant, respondents aged 47 years and older had a higher mean knowledge score compared with the younger participants. There was no significant association between the work experience and the levels of knowledge ($p > 0.05$).

The West Rand Health District offered seven in-house training sessions with the aim of encouraging nurses to incorporate nutritional assessment and support when implementing the existing child health programme such as the expanded immunisation programme (EPI). Attendance on these courses varied, as depicted in Figure 1. The courses were: Prevention of Mother to Child Transmission (PMTCT), 8-hour Nutrition and Child Health training, Lactation Management Course (LMC), Growth Monitoring, Nutrition Assessment, Counselling and Support (GMNACS), Integrated Management of Childhood Illnesses (IMCI) and Severe Acute Malnutrition (SAM).[14] The courses with highest attendance rates were IMCI (76%) and PMTCT (65%) and the two least attended were LMC (16%) and three-day SAM (18%). Almost three-quarters (74%) of the respondents did not attend any course at all. The overall attendance on the child health and nutrition courses was poor. There was no significant association between the knowledge scores and the attendance on these courses ($p > 0.05$).

Table 2: Practice patterns, availability of anthropometric equipment and their utilisation ($n = 49$)

Factor	Yes, *n* (%)	No, *n* (%)
Practice patterns:		
Weight measured	48 (98)	1 (2)
Height measured	17 (35)	32 (65)
Mid upper arm circumference (MUAC)	14 (29)	35 (71)
Weight for height	8 (16)	41 (84)
Height for age	9 (18)	41 (84)
Weight for age	38 (78)	11 (22)
Recording in the child file	44 (90)	5 (10)
Recording in Road to health booklet	44 (90)	5 (10)
Availability of equipment in the facilities:		
Paediatric scale	49 (100)	0 (0)
MUAC tape	45 (92)	4 (8)
Length board	44 (90)	5 (10)

The practice patterns and the presence of equipment at the PHC facilities can be seen in Table 2. Almost all participants (98%) took weight measurements but only 35% and 29% measured the height and the MUAC respectively. As regards the plotting of the graphs in the patient's file, 78% recorded the weight for age and less than 20% recorded the height for age. Most of the participants (90%) recorded the measurements in the patient's file and the Road to Health booklet respectively (Table 3).

As far as the practice categories were concerned, two-thirds of the participants (61%) displayed poor practices and 21% had good practices, whilst only 18% displayed best practices. The mean practice score was 4.5.

The participants with poor practices attended an average of three courses as compared with those showing good and best practices, who attended nearly 2.5 courses. Although not significant, those with good and best practices had a higher

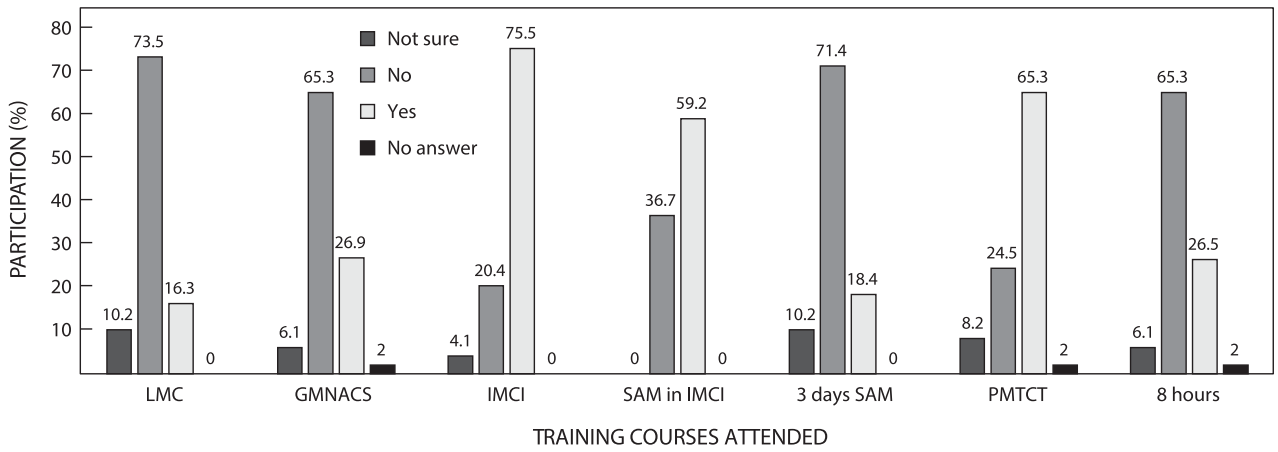

Figure 1: Training courses attended.

Table 3: Association between the means of practice categories, attendance on courses and knowledge score ($n = 49$)

Practice category		Mean number of courses attended	*p*-value	Knowledge score	*p*-value
Poor	Mean	3.0 (±1.691)	0.69	19.60 (±4.739)	0.29
	n	30 (61%)		30	
Good	Mean	2.8 (±1.687)		21.5 (±2.718)	
	n	10 (21%)		10	
Best	Mean	2.44 (±2.404)		21.44 (±2.12)	
	n	9 (18%)		9	
	Standard deviation	2.404		2.12	
Total	Mean	2.8 (±1.810)		20.33 (±4.069)	
	n	49		49	

level of knowledge. There was no association between attendance on courses, knowledge scores and practice patterns.

Discussion

The response rate was 94% and this could have been due to the fact the researcher went personally to drop off the questionnaires and collect them once completed. It could also be because the researcher observed the participants personally.

Almost two-thirds (61%) of the participants had good knowledge, followed by 33% with excellent knowledge and 6% had poor knowledge. Although not significant, it was found that nurses over 47 years of age had a higher mean knowledge score compared with younger participants, which was similar to another study done whose subjects were nurses.[15] In contrast to the present study, these nurses had poor to moderate knowledge of nutrition.

There was no association between the attendance on courses and the mean knowledge scores. Nurses with poor knowledge had attended more courses than those with good and excellent knowledge. It was strange that nurses with poor knowledge had on average attended more courses as the expectation was that nurses with good knowledge would have attended more courses. This needs to be investigated further.

Overall, the attendance on the courses was found to be poor. The reason might be frequency of the courses and the fact that nurses attended a relevant course only if they were in the rotation associated with the course being offered. Another contributor to poor attendance might be the fact that, if there were staff shortages, nurses were not released or available to attend the courses because of service delivery needs and priorities.

Warber *et al*., in their study of nurses in New England, indicated that poor knowledge on nutrition may be the result of a low priority given to education on nutrition.[16] A Turkish study on the knowledge of nurses concerning nutrition indicated that nutrition lectures during the formal training of nurses did not increase the level of knowledge of nutrition, which is in agreement with the present study.[17]

A study of doctors and nurses reported that insufficient nutritional knowledge contributed towards mismanagement of severe acute malnutrition.[18] The study also emphasised that nurses and doctors should have refresher courses on nutrition as many of the health professionals used outdated methods and could not conduct a complete physical examination or record anthropometric measurements.[18]

A Turkish study reported that nurses with higher knowledge scores conducted more physical examinations and were able to notice malnutrition more regularly compared with those displaying poor knowledge.[17] Although not significant in the current study it was also found that respondents who displayed good and excellent knowledge had better practice patterns than nurses with poor knowledge. The practice patterns in the study were generally poor. The findings of this study with regard to practice were in agreement with an Indian study that assessed the knowledge of health workers on IMCI and reported that even though the nurses were trained and had knowledge, they were not implementing what they knew.[19] Studies conducted in Turkey, India and England also showed that knowledge did not translate to the good practice of taking anthropometric measurements, which is a factor in the present study.[16,17,20]

Years of experience had no bearing on knowledge and practice patterns in the current study. This finding was supported by other, similar studies.[15,17]

All the clinics had paediatric scales and almost all had MUAC tapes and length boards. Although the equipment was available, less than 40% made use of the MUAC tape and length boards. As far as practice patterns were concerned, 78% of respondents completed the weight-for-age data while less than 20% completed the height-for-age data. This indicated that although the necessary equipment was available, the necessary measurements were not taken at each visit. The weight-for-age indicator was most often recorded (78%). The lack of recording other indicators could be due to the fact that some of the clinics (20) had only one nurse employed and, owing to the workload, the nurse could not record all the necessary data.

In the case where one nurse was working, the implication was that the nurse had to take measurements and record them. The study finding also noted that not all the anthropometric measurements were done consistently. The issue of clinics with only one nurse working with children might have contributed but in general practice patterns were poor and this might need to be investigated further.

Considering nurses' role as first-line healthcare providers at the PHC facilities, appropriate knowledge regarding the nutritional assessment, diagnosis, support and care is necessary to improve the patients' nutritional status and to prevent malnutrition, particularly in children aged under five years. While the nurses had good knowledge, the practice patterns were mainly poor and not all the anthropometric measurements were done and

recorded. These factors have been identified as factors with the potential to lead to missed opportunities and delay in diagnosing malnutrition in children.

Limitations

This study's findings should be interpreted with caution, as there are some study design limitations. For example, this was a cross-sectional study, therefore causality cannot be inferred. The observation was done for only one consultation per nurse, and it was possible that participants behaved in ways that may be more socially desirable for the researcher to observe, whereas in their absence the practice might be different.

Conclusion

Most participants had good or excellent knowledge around issues of malnutrition. There was poor attendance on courses and there was no association between knowledge and attendance on the courses. More than 60% of the nurses had poor practice patterns and there was no association between knowledge, attendance on courses and practice patterns. Although most of the clinics had the recommended equipment for the measurement of anthropometric scores, not all anthropometric measurements were recorded routinely, except for the measurement of the weight. The plotting of the measurements was also not done consistently, except for the plotting of the weight for age.

Recommendations

The usage of the length board and the mid-upper arm circumference must be done routinely for each patient and these measurements must be plotted on the patient's file as per the WHO guidelines. This must be monitored by managers and/or peers.

The number of nurses should be increased so that each facility has at least two PHC nurses to carry out the examinations and recordings according to the WHO guidelines.

It is recommended that the knowledge levels of the nurses be improved by insisting that they attend and possibly be assessed on relevant courses that they attend.

Acknowledgements – The authors would like to thank all the participants for their time and willingness to participate in the study.

Disclosure statement – No potential conflict of interest was reported by the authors.

Ethical considerations – Ethical approval was obtained from the University of Pretoria, Faculty of Health Sciences Ethics committee and from the Gauteng Department of Health Ethics committee (reference number 64/2018). All the data were anonymous, confidentiality was maintained, and all the participants signed the consent to participate in the study.

ORCID

TK Madiba http://orcid.org/0000-0002-0171-0595
A Bhayat http://orcid.org/0000-0002-8103-1233

References

1. United Nations Children's Fund, the World Health Organization, World Bank group [Internet]. Levels and trends in child malnutrition joint child malnutrition estimates key findings of the 2017 edition. Geneva. [updated 2017, cited 2017 Oct 2]. Available from: uni.cf/jmedashboard.
2. Development Initiatives. *2018 global nutrition report: shining a light to spur action on nutrition*. Bristol; 2018. Available from: https://globalnutritionreport.org/documents/352/2018_Global_Nutrition_Report.pdf. [Accessed 11 April 2019].
3. United Nations Children's Fund [Internet]. First 1000 days: the critical window to ensure that children survive and thrive. [updated 2019 Mar, cited 2019 Apr 10]. Available from: https://www.unicef.org/southafrica/sites/unicef.org.southafrica/files/2019-03/ZAF-first-1000-days-brief-2017.pdf.
4. Antwi S. Malnutrition: missed opportunities for diagnosis. *Ghana Med J*. 2008;42(3):101–4.
5. Nzefa LD, Monebenimp F, Äng C. Undernutrition among children under five in the Bandja village of Cameroon, Africa. *SAJCN*. 2019;32(2):46–50.
6. National Department of Health, Republic of South Africa. *Integrated management of childhood illnesses booklet 2014*. Pretoria; 2014. Available from: https://www.knowledgehub.org.za/elibrary/integrated-management-childhood-illness-imci-2019. [Accessed 24 April 2019].
7. Department of Presidency; Republic of South Africa, National planning Commission [Internet]. *National development plan 2030: our future-make it work*. Pretoria: South African Government; [updated 2016; cited 2017 Aug 28]. Available from: https://www.gov.za/issues/national-development-plan-2030.
8. United Nations Department of Global Communications [Internet]. Sustainable development goals. United Nations. [updated January 2019, cited 2019 April 24]. Available from: https://www.un.org/sustainabledevelopment/wp-content/uploads/2019/01/SDG_Guidelines_January_2019.pdf.
9. National Department of Health, Republic of South Africa. *Integrated management of children with acute malnutrition in South Africa: operational guidelines*. Pretoria; 2015. Available from: https://profmoosa.com/wp-content/uploads/2019/09/guidelines_acute_malnutrition_south_africa_2015.pdf. [Accessed 10 June 2019].
10. Akugizibwe R, Kasolo J, Makubuya DB, et al. Missed opportunities in the diagnosis and management of protein energy malnutrition among children under 5 years in Wakiso district, Uganda. *J Public Health Epidemiol*. 2013;30(5(11)):463–70.
11. Modi P, Nasrin S, Hawes M, et al. Midupper arm circumference outperforms weight-based measures of nutritional stauts in children with diarrhea. *J Nutr [Internet]*. 2015;145:158–7. [updated 2015, cited 2017 Nov 01] Available from: jn.nutrition.org.
12. De Onis M, Blossner M. The World Health Organization global database on child growth and malnutrition: methodology and applications. *Int Journal of Epi*. 2003;32:518–26.
13. Macías YF, Glasauer P. *Guidelines for assessing nutrition-related knowledge, attitudes and practices manual*. Rome: Food and Agriculture Organization of the United Nations; 2014.
14. West Rand Health District. 2014–2017. [Unpublished data]. Gauteng; 2019.
15. Schaller C, James EL. The nutritional knowledge of Australian nurses. *Nurse Educ Today*. 2005;25:405–12.
16. Warber JI, Warber P, Simone K. Assessment of general nutrition knowledge of nurse practitioner in New England. *J Am Diet Assoc*. 2000;100(3):368–70.
17. Yalcin N, Cihan A, Gundogdu H, et al. Nutrition knowledge level of nurses. *J Health Sci*. 2013;7(1):99–108.
18. Gaur A, Bansal A. Severe acute malnutrition: what is lacking in the office practice. *Int J Contemp Pediatr*. 2016;3(3):1064–70.
19. Joshi KJ, Koringa HT, Sochaliya KM, et al. A study on knowledge regarding integrated management of neonatal and childhood illness among trained anganwadi workers of Surendranagar district, Gujarat, India. *Int J Community Med Public Health*. 2016;3(2):581–5.
20. Crogan NL, Bronwynne C. Nutrition assessment: experience is not a predictor of knowledge. *J Contin Educ Nurs*. 2001;32(5):219–22.

Received: 1-12-2020 Accepted: 25-01-2022