



Anthropometric knowledge and measurement evaluation among female volunteer community health workers in Depok

Dian Luthfiana Sufyan, Firlia Ayu Arini*, Ibnu Malkan Bakhrol Ilmi, Avliya Quratul Marjan, Iin Fatmawati

Department of Nutrition, Faculty of Health Sciences, UPN Veteran Jakarta, Jalan RS Fatmawati Pondok Labu, Jakarta, Indonesia

*Correspondence: ferliifs.ff@gmail.com

ABSTRAK

Latar Belakang: Pada level komunitas, penilaian status gizi anak dilakukan oleh kader Pos Pelayanan Terpadu (Posyandu) setiap bulan. Berdasarkan observasi analisis situasi, para kader memiliki pengetahuan yang cukup terkait pengukuran antropometri, namun dalam praktiknya masih ditemukan kesalahan, sebab kader tidak menjalani pelatihan secara formal melalui jalur pendidikan, oleh sebab itu kegiatan pelatihan dan penyegaran kembali terkait pengukuran antropometri sangat diperlukan.

Tujuan: Kegiatan ini merupakan bagian dari proyek Kampung Caraka yang bertujuan untuk meningkatkan kesadaran akan Kesehatan komunitas di daerah Kedaung Depok. Lebih spesifik, studi ini bertujuan untuk mengevaluasi pengetahuan kader serta tingkat presisi dan akurasi pengukuran antropometri.

Metode: Tiga puluh sembilan kader berpartisipasi dalam studi intervensi ini yang berasal dari 13 posyandu di daerah Kedaung Depok. Kriteria inklusi meliputi kader dengan minimal masa kerja satu tahun, dan akan dieksklusi jika tidak mengikuti seluruh rangkaian kegiatan. Edukasi antropometri diberikan sebelum evaluasi dilakukan. Evaluasi pengetahuan diukur menggunakan kuesioner pre-test dan post-test yang terdiri dari 10 pertanyaan. Evaluasi presisi dan akurasi dilakukan untuk pengukuran panjang badan, tinggi badan, lingkaran lengan atas (Lila) dan lingkaran kepala (Lika). Emergency Nutrition Assessment (ENA) Smart digunakan untuk mengevaluasi presisi dan akurasi. Analisis deskriptif dilakukan untuk menyajikan tingkat presisi dan akurasi pengukuran kader. Uji Wilcoxon dilakukan untuk mengetahui perbedaan median skor pretest dan posttest.

Hasil: Hasil menunjukkan persentase kader dengan presisi yang baik pada pengukuran Lila, tinggi, Lika dan Panjang badan masing-masing sebesar 23.1%, 23,1%, 52.8% dan 33.3%. Sebaliknya, hanya 7.7% kader yang memiliki akurasi baik pada pengukuran Lila. Terdapat perbedaan bermakna antara skor media kader sebelum dan setelah diberikan intervensi (p-Value 0.02, CI 95%).

Kesimpulan: Kader yang berpartisipasi pada studi ini memiliki presisi yang baik namun akurasi yang kurang. Hal ini berimplikasi pada kebutuhan prosedur standar serta kalibrasi alat sebelum dilakukannya pengukuran antropometri. Pemberian edukasi yang komprehensif diperlukan untuk meningkatkan pengetahuan kader.

KATA KUNCI: akurasi; antropometri; emergency nutrition assessment; kader, posyandu



ABSTRACT

Background: At the community level, assessment for children nutritional status is measured by female volunteer community health workers (FVCHW) through integrated health post (Posyandu). Based on initial observation, volunteers have sufficient knowledge of anthropometric measurement however, to put it into practice, common pitfalls remain found. Refreshment on basic knowledge and practical training on anthropometric assessment is needed.

Objectives: As part of Kampung Caraka Project that attempts to empower locals to be deliberately aware of community health and well-being, this particular study aims to evaluate knowledge of FVCHW as well as their accuracy and precision on anthropometric assessment.

Methods: This study is a quasi-experimental study with pre-posttest with control group design. The sample was purposively selected and 54 overweight adolescents were divided into a control group and two intervention groups. Education using healthy snacks quartet was conducted for 21 days from September to October 2023 in Makassar City. Data analysis was performed using Wilcoxon signed ranks test.

Results: Results showed women with good precision for MUAC, height, head circumferences and length measurement were 23.1%, 23.1%, 53.8% and 33.3%, respectively. In contrast, only 7.7% of women had good accuracy on MUAC measurement. There is a significant difference of knowledge score before and after the education given (p -value 0.02, CI 95%).

Conclusions: The cadre had good precision yet poor accuracy, implying the necessity of standardized procedure and regular equipment calibration prior to anthropometric measurement. There is a difference in mean scores before and after the education given, yet still denoted as low capacity. Further comprehensive education is highly required.

KEYWORDS: accuracy; anthropometric; emergency nutrition assessment; female volunteer community health workers; posyandu

Article info:

Article submitted on October 10, 2023

Articles revised on March 13, 2024

Articles received on May 23, 2024

INTRODUCTION

In Indonesia, nutrition surveillance among under-five children highly relies on the Integrated Health Post (Posyandu). Under the auspices of the Community Health Centre (Puskesmas), Posyandu is organized monthly in order to provide nutritional outcomes data, mainly on children (1). The anthropometric measurement on Posyandu is conducted by female volunteer community health workers (FVCHW), who are not trained through formal education and most of the time have diverse backgrounds (2). As such, a regular knowledge refreshment on anthropometric measurement is needed to ensure data quality (3). To date, the role of integrated health post varies from assessing and documenting under-five children nutritional status to providing complementary feeding. Vast number of children within the health center working area, make the job done voluntarily by the locals (4). Most of the

time, integrated health post involves stay at home mothers with various educational backgrounds. Monthly, FVCHW will organize the activity of nutritional anthropometric assessment such as measuring weight, height and length as well as taking notes on KIA book (buku kesehatan ibu dan anak). As such, the anthropometric data quality relies upon the capacity of each FVCHW (5). High quality data to identify malnutrition is inevitable. Therefore, a standardized procedure is needed for anthropometric measurement (6). Short term evaluation can be done through knowledge evaluation, while to be more technical, evaluation on precision and accuracy can be useful for future improvement. Precision is defined as how similar two repeated measurement, while accuracy is how close a measurement to the true value or gold standard (7). Lack of precision can be caused by random error, particularly when the measurer does not apply a standardized

procedure that leads to high measurement variability. Poor accuracy can be caused by systematic error or bias that depend on equipment, such as no calibration prior to measurement (8).

Kampung Caraka is a project funded by Indonesia Ministry of Education, Culture, Research and Technology that aims to improve nutritional outcomes and livelihoods of population in Kedaung Depok. The study conduct is governed by Universitas Pembangunan Nasional Veteran Jakarta. As part of the project, the present study aims to educate and evaluate female volunteer community health workers capacity on conducting nutritional anthropometry.

MATERIALS AND METHODS

The present intervention study involved all integrated health posts in Kedaung Depok. Further, a voluntary sampling was carried out to select three female volunteers in each post. Initially, thirty-nine participants were expected to join the study, however, only 32 who were committed to the end of the program.

Training

The training for FVCHW was took place in Kedaung Depok municipality office for one day on September 2023. We trained a total of 32 female volunteers from 13 different integrated health posts prior to the evaluation. The objectives of the training were to refresh the operational procedure and measurement technique of each measurement and have the participants' oversight be corrected by the trainer. There are four trainers with expertise on anthropometric assessment from Universitas Pembangunan Nasional "Veteran" Jakarta. The training session lasted for 2 hours and ended with a question-and-answer session. Several equipment was used during the training, such as length board, multipurpose height measurer, MUAC tape and head circumference tape.

Knowledge evaluation

Evaluation in terms of knowledge was performed using paper based pre and posttests consisting of 10 multiple choice questions related to the objectives of anthropometry measurement, standard procedure, and common pitfalls. Validity of the questionnaire was checked using biserial

correlation ($r > 0.27$). Correct answers were coded 1, while incorrect answers were coded 0.

Precision and Accuracy evaluation

After 2 hours of anthropometry training and practice, a two-round independent measurement was undertaken to evaluate precision and accuracy. During the evaluation, participants were grouped based on their post. Thus, they needed to divide roles as measurer, assistant measurer and observer during measurement. The result note taking was conducted by the committee. Measurement was conducted independently to prevent participants being influenced by the previous result. Likewise, the referee (gold standard) performed the same round of measurement. Precision was evaluated based on how close is the first to second measurement result. Accuracy was examined based on how close the participant measurement is to the gold standard.

Statistical analysis

Precision and accuracy evaluation was performed using Emergency Nutrition Assessment (ENA) Smart. Good precision was indicated when the measurer's sum of difference in square was less than twice gold standard's. While Good accuracy was observed when the measurer's sum of difference in square was less than thrice of gold standard's. Then, the result of measurement evaluation was presented using percentage. Wilcoxon test was used to observe the difference between median score of pretest and posttest.

Ethics

The study was ethically approved by the Scientific and Ethical Review Committee at Universitas Pembangunan Nasional "Veteran" Jakarta (Ref:298/VI/2023/KEPK). Informed verbal consent was given by the participants prior to the study conduct.

RESULTS AND DISCUSSIONS

Respondents ranged in age from 25 to 60 years and worked as housewives and cadres at the Kedaung Integrated Healthcare (Posyandu), Sawangan, Depok City. The cadres' highest education is high school. The results of statistical analysis using the Wilcoxon test showed that there

was a significant difference between anthropometric measurements in children and anthropometric knowledge on the pretest and adults..
 posttest. Questionnaire questions include

Table 1. Result in Anthropometric Knowledge of FVCWH (n = 32)

Variable	Pretest	Posttest	Wilcoxon Result
Anthropometric Knowledge	4,00 (IQR:2)	5,00 (IQR: 2)	p = 0,035

Pretest and posttest score was displayed as median and inter quartile range (IQR) as the data not normally distributed.

Before the training, the median of anthropometric knowledge score was 4, which counted by the correct answer from 10 questions.

After the training, the score of anthropometric knowledge had increased.

Tabel 2. Precision and Accuracy of FVCWH (n = 32)

Measurements	Precision (%)		Accuracy (%)	
	Poor	Good	Poor	Good
Head Circumference	46.2	53.8	100	-
Body-length	66.7	33.3	92.3	7.7
MUAC	76.9	23.1	92.3	7.7
Body-height	76.9	23.1	100	0

The research results showed that 53.8% of cadres had good precision but 100% had poor accuracy results. Based on the results of measuring body length, upper arm circumference and body height, it shows that the majority of cadres have poor measurement precision and accuracy.

Knowledge in anthropometric measurement skills for posyandu cadres is very necessary because incorrect anthropometric measurements result in errors in data interpretation. The guidelines for health assessments in the Child Health and Disability Prevention (CHDP) Program recommend that anthropometric measurements should be taken during every preventive visit for children and adolescents to ensure their growth patterns are on track (9). The key element of anthropometry is the accurate and consistent measurement of specific parameters over time. For infants and toddlers under two years old, these parameters include weight, length, and head circumference, while for children over two years, it includes weight and length (10).

To assess these measurements, they should be plotted on gender and age-specific charts provided by the World Health Organization (WHO) or the CDC. This allows for a comparison of the child's measurements to the average values of the general population. Isolated anthropometric measurements have limited utility; it is essential to compare the values to the appropriate population's standards. The CHDP program offers free preventive health exams and immunizations aimed at early detection and prevention of diseases and disabilities for infants, children, and teens who meet the program's criteria. Through CHDP, eligible children receive regular preventive health assessments and immunizations. Children showing signs of potential health issues can be referred for further diagnosis and treatment (10).

It is important to pay attention to precision and accuracy in measurements to obtain measurements that have a high level of validation and reliability. Reliability consists of two elements: Precision, denoting the consistency in measurements over time, and dependability, reflecting physiological variations within an

individual. Accuracy, on the other hand, pertains to how closely a measurement aligns with its 'true' value. The reliability of measurements is affected by random errors, impacting precision, while inaccuracy results from systematic bias. Various factors, such as observer-related issues (e.g., inconsistencies in landmark identification or instrument pressure) and subject-related issues (e.g., influenced by respiration or posture changes), can influence reliability. Inaccuracy may stem from instrument errors or errors in the measurement technique (11).

While complete avoidance of measurement errors is challenging, their mitigation is feasible. We recommend investigators prioritize a quality assurance protocol encompassing six essential steps for anthropometric measurements: Utilizing a certified lead anthropometrist and trainer, adhering to a manual of standard operating procedures, employing robust equipment, regularly calibrating equipment, providing standardization training and certification and implementing resampling (approximately 5-10% (11).

One of the efforts to monitor nutritional status in Indonesia is by mobilizing posyandu activities. Several studies related to measuring nutritional status in posyandu have proven to play a role in improving children's nutrition in Indonesia (12). However, not all FVCHW have good nutritional status measurement capabilities. This could be due to poor availability of measurement tools (13) and poor skills in measuring the nutritional status of FVCHW (14). The results of this research are in line with Suyatno's research at 94 posyandu which showed that the level of ability, thoroughness and accuracy was still very low.

Precision is the degree of closeness of measurement results in repeated measurements of the same variable under conditions that do not change or are not much different. Precision is good if the results of the first, second and so on measurements are almost the same or close together. Meanwhile, accuracy is the level of closeness of the measurement to the true value (15). Precision and accuracy tests really

3. masyarakat Bintan. Berita Kedokteran Masyarakat. 2017;33(1):13.

determine the quality of measuring results. Precision and accuracy in measuring nutritional status can be influenced by the person doing the measurement, the instrument used and the subject or respondent (15). If an FVCHW is not trained in measuring precision and accuracy, data will be produced that is at risk of being inaccurate. This will result in errors in determining a child's nutritional status.

This research shows that the level of accuracy in measuring nutritional status in Posyandu is still low. Posyandu assistance and training in stages needs to be carried out regularly to improve the accuracy of FVCHW measurements. One article highlights the issue of low accuracy in measuring nutritional status at Posyandu centers. It points out that the inadequate skills of the volunteers in measuring length and height can lead to inaccurate detection of stunting in children. Consequently, it underscores the need for regular, staged Posyandu assistance and training to enhance the precision of FVCHW measurements. The article underscores the crucial role of training and support in ensuring measurement accuracy. The solution lies in consistent, staged training and support for Posyandu volunteers to enhance the accuracy of FVCHW measurements. Adequate training and guidance can lead to improved precision in anthropometric measurements (16).

CONCLUSION AND RECOMMENDATION

Women participating in this study had good precision yet poor accuracy, implying the necessity of standardized procedure and regular equipment calibration prior to anthropometric measurement. There is a difference in mean scores before and after the education given, yet still denoted as low capacity. Further and more comprehensive education is highly required.

REFERENCES

1. Saepuddin E, Rizal E, Rusmana A. Posyandu Roles as Mothers and Child Health Information Center. Record and Library Journal. 2018;3(2):201.
2. Susanto F, Claramita M, Handayani S. Peran kader posyandu dalam memberdayakan
4. Artanti S, Ulya N. Refreshing Kader Posyandu Bayi dan Balita sebagai Upaya Peningkatan

- Pengetahuan dan Keterampilan di Puskesmas Tirto. *Jurnal ABDIMAS-HIP Pengabdian Kepada Masyarakat*. 2023;4(1):6–10.
5. Didah D. Gambaran peran dan fungsi kader posyandu di wilayah kerja puskesmas Jatinangor. *Jurnal Kebidanan Malahayati*. 2020;6(2):217–21.
 6. Nur Imanah ND, Sukmawati E. Peran Serta Kader Dalam Kegiatan Posyandu Balita Dengan Jumlah Kunjungan Balita Pada Era New Normal. *Jurnal Kebidanan Indonesia*. 2021;12(1):95–105.
 7. Coburn-Miller C, Casey S, Luong Q, Cameron N, Hocevar-Trnka J, Leung DH, et al. Standardization of Research-Quality Anthropometric Measurement of Infants and Implementation in a Multicenter Study. *Journal of Clinical and Translational Science*. 2015;8(4):330–3.
 8. Mocini E, Cammarota C, Frigerio F, Muzzioli L, Picciocchi C, Lacalaprince D, et al. Digital Anthropometry: A Systematic Review on Precision, Reliability and Accuracy of Most Popular Existing Technologies. *Nutrients*. 2023;15(2):1–39.
 9. Grellety E, Golden MH. The effect of random error on diagnostic accuracy illustrated with the anthropometric diagnosis of malnutrition. *PLoS One*. 2016;11(12):1–27.
 10. Fryar CD, Gu Q, Ogden CL. Anthropometric reference data for children and adults: United States, 2007-2010. *Vital Health Stat 11*. 2012 Oct;(252):1–48.
 11. Warriar V, Krishan K, Shedge R, Kanchan T. Height Assessment. In *Treasure Island (FL)*; 2023.
 12. Mony PK, Swaminathan S, Gajendran JK, Vaz M. Quality Assurance for Accuracy of Anthropometric Measurements in Clinical and Epidemiological Studies: [Errare humanum est = to err is human]. *Indian Journal of Community Medicine*. 2016;41(2):98–102.
 13. Anwar F, Khomsan A, Sukandar D, Riyadi H, Mudjajanto ES. High participation in the Posyandu nutrition program improved children nutritional status. *Nutrition Research and Practice*. 2010 Jun;4(3):208–14.
 14. Rinawan FR, Faza A, Susanti AI, Purnama WG, Indraswari N, Didah, et al. Posyandu Application for Monitoring Children Under-Five: A 3-Year Data Quality Map in Indonesia. *ISPRS International Journal Geo-Information*. 2022;11(7).
 15. Kalsum U, Jahari AB. The strategy to reduce the prevalence of malnutrition among children under five in Jambi Province (Strategi menurunkan prevalensi gizi kurang pada balita di Provinsi Jambi). *Jember Medical Journal*. 2015;3(1):45–59.
 16. Gibson RS. *Principles of Nutritional Assessment* - Rosalind S. Gibson - Google Books. Oxford University Press. 2005.
 17. Suyatno, Fatimah S, Kartasurya MI. Policy brief akurasi pemantauan status gizi di Posyandu memperhatikan. Semarang: Universitas Diponegoro; 2019. p. 1.