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Data Quality of Nutritional Status among Children Using WHO Anthro Application: A Quasi-Experimental Study

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ABSTRACT

This study aims to look at improving the quality of nutritional status data through WHO Anthro training in stunting focus areas. This study used a quasi-experimental quantitative method with a pretest-posttest equivalent repeated measures framework approach, using two groups. A total of 40 kindergarten teachers were sampled, divided equally into two groups. The control group was taught how to plot nutritional status using WHO charts and the intervention group was trained how to use the WHO Anthro application. Data was analyzed by non-parametrical means with a Friedman test to compare the pre-mid-post data in each group of different samples. The group trained by WHO Anthro showed that the data quality on nutritional status was significantly different, with a p=0.000. The evaluation conducted after two months of training proved to be significantly different in terms of information and data accuracy with p=0.030 and p=0.040, respectively. WHO Anthro is proven to be able to facilitate kindergarten teachers in determining the nutritional status of students, and the resulting nutritional status reports are of higher quality because they are more accurate and useful for early detection of stunting in each school.

Keywords: data quality, nutritional status, stunted, WHO anthro

INTRODUCTION

Nutrition in Indonesia is still a major issue, even becoming one of the targets of the Sustainable Development Goals (SDGs) related to reducing under-five mortality due to undernutrition and malnutrition (Mabuza 2020). The nutrition problem in Indonesia is called the triple burden, which consists of undernutrition and overnutrition for macronutrients, and undernutrition for micronutrients. These nutrition problems jeopardize the quality of Indonesia's future generations (Rah *et al.* 2021). Based on the Indonesian Nutritional Status Survey 2021, it was found that the prevalence of stunting was 24.4% (MoH RI 2021), while according to the Survei Demografi Kesehatan Indonesia 2018, it was found that the prevalence of stunting was as much as 19.3%, malnutrition as much as 3.9%, and obesity was as much as 8% (MoH RI 2018). The health profile of D.I Yogyakarta province found that the status of malnutrition and undernutrition was 8.3%. The incidence of stunting was 11.08%, while the incidence of overnutrition was 3.14 (Dinas Kesehatan Yogyakarta 2020).

The efforts that can be applied to prevent and overcome nutritional problems in preschool-age children are screening and surveys. Screening consists of observing the growth and development of preschool-age children at various service sites, such as health centers, posyandu, and educational institutions (MoH RI 2020b). A monthly growth and development screening is carried out by taking the weight and height of the kids. Measurements of height using a microtoise and weight using digital scales were utilized in this growth and development detection study on kindergarten students in Semarang to identify nutritional issues in preschoolers (Tsani *et al.* 2022).

The problems that happened were the lack of teacher knowledge in terms of how to measure growth correctly, non-standard measuring instruments, and the lack of teacher knowledge in interpreting the measurement results. This is comparable to Wahyuntari's community service project, wherein she discovered that there was no charting on the Growth Chart (*Kartu Menuju Sehat*) during the cadres' execution of child growth observations, and consequently, no interpretation of the findings (Wahyuntari & Herfanda 2022). Data entry of growth measurements of body weight and height is essential for early

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detection of nutritional problems (Wahyuni 2018). According to research by Aditianti *et al.* (2019), cadres of posyandu have also observed children's growth; however, neither the results of the children's nutritional status nor the results of weight and height measurements have been plotted to observe growth.

In the development of technology, the World Health Organization (WHO) developed an application called WHO Anthro as one of the applications used to observe child growth and development by inputting measurement data consisting of weight, height, age, sex, measurement position (for height: standing or recumbent) of children. WHO Anthro is software to facilitate the implementation of motor growth and development observations in individuals and populations of children up to 5 years of age and children aged 5−19 years using WHO Anthro. Nutrition workers who effectively utilized WHO Anthro demonstrated noteworthy outcomes in which the application and training of WHO Anthro enhanced the quality and perception of nutritional status information (Rahmad & Sudargo 2016).

The purpose of this study is to compare the efficacy of WHO Anthro Software with the conventional approach for anthropometry evaluation. This study is interesting because it examines the role that schools play in the fight against malnutrition. Specifically, it looks at how kindergarten teachers might use the WHO Anthro Application to determine their students' nutritional status.

METHODS

Design, location, and time

This research was conducted using Quasi-Experimental study design. The framework of the approach used was a repeated equal pre- and post-test using two groups. It was conducted in January−March 2023 at 20 ABA Kapa−newon Gamping kindergartens.

Sampling

The population in this study was all ABA kindergarten teachers in the Kapenawon Gamping area, totaling 98 teachers. The sample of this study was 40 ABA kindergarten teachers who were divided evenly into two groups, namely the intervention group and the control group (each group consisted of 20 teachers) who taught at ABA kindergartens in the working area of Puskesmas Gamping I and II. The inclusion criteria of this study are ABA kindergarten teachers who are active and registered in ABA kindergartens in the Gamping Health Center area, who are willing to become respondents and are proven by signing informed consent. The exclusion criteria of this study are teachers who did not attend the training and did not complete the data quality questionnaire for three repetitions. This study has obtained a research ethics eligibility letter from the ethics committee of 'Aisyiyah University Yogyakarta with number 2595/KEP-UNISA/II/2023.

Data collection

A questionnaire on respondent characteristics and the quality of the information in the nutritional status questionnaire data made up the study instrument. Data on the characteristics of ABA kindergarten teachers were taken directly during registration. Information about the nutritional state of ABA kindergarten students was gathered from questionnaires that assessed participants' understanding of the course materials and from observations made by instructors during evaluations that took place prior to, during, and two months following the training. The nutritional status data quality is assessed using these three criteria: correctness, informational value, and timely reporting. The research instruments used have reliability and validity ratings of 0.63 and 0.67, respectively.

The training was conducted over two days for two groups. The intervention group received training on the WHO Anthro and the control group received training on the application of WHO manual charts. To allow participants the chance to adopt anthropometric measurements and assess nutritional status in each kindergarten, there is a two-month delay between the mid-test and post-test data collection

Data analysis

Each group completed three tests. assessments given before, during, and after the test. Before teachers receive training materials, a pretest is carried out. After teachers receive the training materials, they take part in a midday test evaluation. The post-training assessment was carried out two months later. The Friedman test was used to analyze the three assessment results.

RESULTS AND DISCUSSION

Research subject characteristic

The characteristics of the study subjects consisted of the aspects of age and latest education, where each group, whether for intervention or for control, consisted of at least 20 people.

Table 1 provides information about the training subjects' demographics, including age and educational background. 90% of the subject in the intervention group held a diploma or bachelor's degree, and 75% of them were older than 55. 90% of participants in the control group were above the age of 55, and 85% of them held a diploma or bachelor's degree.

The data quality of nutritional status on WHO anthro training group

Data analysis consisting of normality and homogeneity tests on three aspects of data quality, namely data accuracy, informativeness, and timeliness of reporting in the group of teachers who received WHO Anthro training. Evaluation of data quality showed that the average results improved before training, during training, and two months after training.

The assessment results of data quality from the aspects of informativeness, data accuracy, and timeliness of reporting in the WHO Anthro training group experienced a significant correlation after repeating the test three times with a p-value of 0.000. This is explained in Table 2.

The results obtained are in accordance with the research of Al Rahmad which states that training with WHO Anthro is effective in improving the quality of nutritional status information after one month of training (Al Rahmad 2020). Training is a program of planned activities to improve the quality of data. Training is a series of activities planned to improve the skills, knowledge, experience, or behavior of participants or trainees. Rini and Huriah's earlier study, which found that training in determining children's nutritional status to prevent stunting using applications with audio visual media

Table 1. Distribution of research subject characteristics by research group (n=40)

Variables	Groups			
	Intervention		Control	
	n	%	n	%
Age				
<55 years old	5	25%	6	30%
≥55 years old	15	75%	14	70%
Education				
Diploma/Bachelor	18	90%	17	85%
Junior High School	2	10%	3	15%

Table 2. Data quality assessment after WHO Anthro training

Aspects of data quality	Pre-test	Mid-test	Post-test	n	X^2
	Mean rank	Mean rank	Mean rank	Chi^2	
Informative	1.50	2.20	2.30	20 (19.000)	0.000*
Data accuracy	1.33	2.10	2.58	20 (22.750)	0.000*
Timely reporting	1.18	2.05	2.78	20 (32.094)	0.000*

Significant on CI:95%; p<0.05

was proven to be more effective in increasing respondents' competence and knowledge significantly with a p value of 0.000 (Rini 2020; Huriah *et al.* 2021). Training conducted for kindergarten teachers can optimize the role of teachers in preventing stunting in preschool children in Indonesia and in London (Andrew *et al.* 2019; Wahyuntari *et al.* 2022). The nutrition education app provides benefits in terms of ease of use and improved skills in observing children's nutritional status compared to conventional methods (Ernawati *et al.* 2021).

The data quality of nutritional status on WHO graph plotting training group

The results of the normality test on three aspects of data quality, namely data accuracy, informativeness, and timely reporting in the control group, are shown in Table 3 below. Data accuracy in the training group that determined nutritional status using WHO charts using traditional methods. The accuracy of interpreting the nutritional status determination based on Minister of Health Regulation No. 2 of 2020, which addresses determining nutritional status using 3 indicators (weight-for-age, height-for-age, body mass index-for-age), is used to examine the correctness of data. In the group of teachers trained on how to manually plot WHO Anthro graphs, it was found that data quality showed an increase in the average score.

Training on the utilization of WHO Anthro for kindergarten teachers is one of the efforts to prevent stunting in preschool children. WHO Anthro is used to easily determine the nutritional status of children because the interpretation of z-score measurements on each indicator appears automatically and is easy to understand. This application can also be used to determine nutritional status through the WHO manual standard growth chart. The results of this study indicate an increase in the score on data quality after using the WHO Anthro standard manual growth chart, but there are still some obstacles using the manual growth chart. In the control group, 20% of teachers lacked the knowledge necessary to interpret their pupils' nutritional status. Therefore, they are only limited to measuring and plotting the graph. It is similar to the research conducted by Hadi, which showed that manual growth charts are easy to use. However, there are difficulties in reading the growth curve by gender and month (Hadi *et al.* 2018).

The recording of nutritional status manually can also be found at the Kasihan I Community Health Center (*Puskesmas*). Plotting nutritional status at *Puskesmas Kasihan I* uses the Growth Chart (*Kartu Menuju Sehat-KMS*) by observing the graph according to WHO standards. This resulted in some inaccuracies in the data reported, and the data was not utilized with a percentage of incomplete data reaching 9.75% in the 2019 nutrition data report (Rohman & Khairunnisa 2020). Despite some of the problems found in the study subjects, in Table 3 there are statistically significant differences between the three times measurement of data quality for each aspect of the data quality because the respondents in this study were still able to make nutritional status reports quite well. The result is evidenced by an increase in the mean rank. In the aspect of informative and accurate data, the pre-test to post-test mean rank increased from 1.40 to 2.33. In aspects of reporting on time, the mean rank from pre-test to post-test increased from 1.45 to 2.50 after receiving the training materials. This can be achieved because participants have high motivation and a great willingness to become nutrition surveillance agents, especially in

Table 3. The disparity in data quality assessment after plotting WHO's manual chart

Aspects of data quality	Pre-test	Mid-test	Post-test	n	X^2
	Mean rank	Mean rank	Mean rank	Chi^2	
Informative	1.40	2.28	2.33	20 (20.140)	0.000*
Data accuracy	1.45	2.23	2.33	20 (20.971)	0.000*
Timely reporting	1.45	2.05	2.50	20 (21.143)	0.000*

Significant on CI:95%; $p<0.05$

screening for nutritional problems in preschool children (Phan *et al.* 2021), where in the Gamping area is still included in the stunting focus location since 2021 (Dinas Kesehatan Sleman 2021).

One aspect of accuracy assessed in this study is the anthropometric measurement method. Anthropometric measurements for children must use standardized methods and equipment (MoH RI 2020a). The equipment that was used for anthropometric measurements in this study were digital scales and microtoise. Teachers are given training related to the procedures for measuring weight and height, where when measuring weight, it is recommended that students who are measured wear minimal clothing/footwear/ hats/bags to avoid measurement bias (Ariati *et al.* 2020). The other accuracy in this study related to providing the data needed to measure nutritional status is the age of the child in months for children aged 0−72 months (MoH RI 2020a). Age is important in determining nutritional status. Inaccurate writing of a child's age in months will result in an incorrect interpretation of nutritional status (Septikasari 2018).

The disparity of data quality in each group can be concluded that there is a fairly large difference in the assessment of data quality in the aspect of timely reporting between the other 2 aspects with a value of p=0.000 (p<0.05). The nutrition team at the health center frequently reports nutritional status reports from each school late and in part. This is due to the incompleteness of the lack of interpretation of the given data about the nutritional status of pupils from each school. Timely nutritional status reports can assist government and health personnel in obtaining accurate and comprehensive data (Barnett *et al.* 2016).

In the anthropometric calculator feature, trainees are facilitated in determining the category of children's nutritional status based on three indicators of nutritional status weight-for-age, height-for-age, body mass index-for-age. It is easier for participants to recognize them as they are displayed in different colors for each category. Thus, teachers can find out the nutritional status of their students easily. The individual assessment feature also helps participants to save the anthropometric measurement results of their students every month, which is very helpful for teachers to search for previous measurement results due to the good data integration for this program. The nutrition survey feature can also be used by kindergarten teachers in mapping the nutritional status of students based on location (Diab 2015). The benefits and accuracy of data after utilizing the WHO Anthro application were proven significant in a previous study, which showed that the Nutrition Service Workers (TPG) of Puskesmas in the Aceh region showed a percentage increase in the quality of nutritional status data information by 13.6% with a standard deviation of 5.623 with a 95% CI in the aspects of accuracy and benefits, each with a p-value=0.000, after carrying out one month of software-based WHO Anthro training (Rahmad & Sudargo 2016).

The effectiveness of training towards the data quality of nutritional status in preschool students who anthro training group

Based on the results, the WHO Anthro training provided to kindergarten teachers proved to be effectively beneficial and produced accurate data (Table 4). The benefits referred to here are not only limited to the results of the data report from WHO Anthro, but also to the improvement of kindergarten teachers' ability to use digital-based applications, with a p-value=0.001 (p<0.05). Previous research found that some teachers have a relatively low level of technological maturity,

Table 4. The effectiveness of WHO Anthro training towards the disparity of data quality

Aspects of data quality	Pre-test - Mid-test			Mid-test - Post-test		
	Mean difference	Standard error	*p*	Mean difference	Standard error	*p*
Informative	10.300	4.504	0.036	10.200	4.504	0.038
Data accuracy	11.250	3.559	0.007	-8.700	3.559	0.046
Timely reporting	21.200	5.626	0.001	-11.550	5.626	0.109*

*Insignificant on CI:95%; p>0.05

so it needs to be improved by holding training activities and innovations that are relevant to mastering digital technology (Astuti *et al.* 2021). The digitization capabilities of existing resources must be improved in order to take advantage of software-based information systems to record nutritional status (Khasanah *et al.* 2022). Based on this information, the research subjects included in the intervention group were able to adapt to the post-COVID-19 pandemic situation so that almost every teacher could benefit after utilizing the WHO Anthro Application.

The teachers in this group were able to see the interpretation of the nutritional status measurement results that had been unknown to the teachers. The training provided to teachers is an effort to screen for child nutrition problems and stunting conditions in children.

The nutritional status of students is not only known by teachers, but also anthropometric measurements will be sent to parents. The reporting aspect is timely because parents can find out information on their child's nutritional status so that they can routinely monitor their child's nutritional intake and growth and development. After knowing the nutritional status of children, it is hoped that parents or guardians can optimize their knowledge so that they can monitor children's nutritional intake by routinely reporting the results of children's growth and development (Nurmaliza & Herlina 2019).

WHO graph plotting training group

Based on the results of the post hoc "multiple comparisons" test using Tukey HSD on the aspects of data accuracy and informativeness, it was found that the average differences from pre-test to mid-test and from mid-test to post-test proved not to be significantly different. This is indicated by an asterisk (*) or p-value>0.05. Regarding the timeliness of reporting, it is proven to be significantly different in the average of pre-test to mid-test and mid-test to post-test with a value of p=0.048 (p<0.05) (Table 5). Therefore, it can be concluded that the average score on the WHO Anthro plotting training has no significant difference on data quality products. The WHO Anthro plotting training has no significant difference in data quality. The WHO manual charting is not sufficient in producing accurate data, but it is still useful because the data produced can be used to provide information on the nutritional status of students to parents.

The research explained that the ABA kindergarten teachers involved in this study were not familiar with how to determine nutritional status using WHO Anthro. Evaluation conducted after two months of training proved to be significantly different in terms of information and data accuracy with p=0.030 and p=0.040. Before the training, the teachers were not able to interpret anthropometric measurement data. Therefore, the nutritional status of students was unknown. One of the services that *Pendidikan Anak Usia Dini* (*PAUD*) institutions should provide to help overcome child nutrition problems is counseling and training on early childhood health, growth, and nutrition (KEMENPPPA 2013).

CONCLUSION

Training on the WHO Anthro and WHO manual growth charts proved effective in improving data quality, in terms of data accuracy, informative aspects, and timely reporting aspects. Data quality from the aspect of timeliness of reporting was seen to be higher in teachers who received WHO Anthro training compared to teachers who received training on WHO standard manual growth charts. The recommendation from

Table 5. The effectiveness of training on WHO graph plotting towards the disparity of data quality

Aspects of data quality	Pre-test - Mid-test			Mid-test - Post-test		
	Mean difference	Standard error	*p*	Mean difference	Standard error	*p*
Informative	10.050	5.229	0.142*	-10.050	5.229	0.142*
Data accuracy	11.000	5.044	0.083*	-10.000	5.044	0.126*
Timely reporting	12.000	4.952	0.048	-12.000	4.952	0.048

*Insignificant on CI:95%; p>0.05

this study is that the use of WHO Anthro is useful to be implemented by kindergarten teachers in early detection of stunting in preschool children.

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DECLARATION OF CONFLICT OF INTERESTS

The authors have no conflict of interest.

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