

The Role of Posyandu Cadres and e-PPGBM Application Operators in Early Detection of Stunting in Kupang City, Nusa Tenggara Timur

Irfan^{1*}, Fitry Handayani¹, Riny Pujiyanti¹, Syaputra Artama²

¹Departement of Nursing, Poltekkes Kemenkes Kupang, East Nusa Tenggara, Indonesia

²Departement of Nursing Ende, Poltekkes Kemenkes Kupang, East Nusa Tenggara, Indonesia

*Corresponding author: irfan1971kupang@gmail.com



ARTICLE INFO

Article History:

Received: 2024-10-13

Accepted: 2024-12-25

Published: 2024-12-30

Keywords:

Posyandu; application;
human; organization;
technology.

ABSTRACT

Introduction: Data from the 2023 electronic recording and reporting system for community-based nutrition (e-PPGBM) shows a stunting rate of 15,2% in NTT, while the 2022 SSGI data reports a stunting rate of 35,3%. The accuracy of data on stunting cases is critical. To date, the Posyandu (integrated health post) in NTT still relies on manual data recording, which is collected at the Puskesmas (community health centers). The city of Kupang has implemented the e-PPGBM system since 2016, but user acceptance has not been fully assessed due to a lack of studies on the subject. Thus, an evaluation of the knowledge, attitudes, roles and also length of work of Posyandu cadres and the acceptance level of e-PPGBM operators in all Puskesmas in Kupang is necessary.

Methods: This study was conducted in 11 Puskesmas in Kupang with 55 Posyandu cadres and 55 e-PPGBM operators as respondents. This study is a mixed- method research. The study used an observational method using questionnaires. System acceptance of e-PPGBM was measured using the HOT (Human-Organization-Technology) model, combined with aspects of regulation and benefits. Qualitative data were collected through in-depth interviews, while secondary data were obtained from e-PPGBM records in the Puskesmas from January to June 2024.

Results: The evaluation of the knowledge, attitude, and role of the cadres in early detection of stunting was categorized as good. There was a significant correlation between length of work experience and knowledge ($p=0.036$, $r=0.036$) and the attitude of the cadres ($p=0.034$, $r=0.054$). The system acceptance measurement of e-PPGBM operators was categorized as good in the human aspect, and very good in the organization, technology, knowledge, regulation, and benefit aspects, with correlations found between all variables.

Conclusion: Posyandu cadres in Kupang have not yet used the e-PPGBM application, monthly recordings at the Posyandu are still manual, and the application is entirely managed by nutrition officers at the Puskesmas. Limited internet access is a major challenge in using the application. Training is needed to involve cadres in using the application, alongside infrastructure improvements (internet network, PCs, and laptops) at both the Posyandu and Puskesmas levels.



©2024 by the authors. Submitted for possible open-access publication under the terms and conditions of the Creative Commons Attribution (CC BY SA) license (<https://creativecommons.org/licenses/by-sa/4.0/>)

INTRODUCTION

The 2022 Indonesian Nutrition Status Survey reported a 2,8% decrease in stunting among children under five, bringing the rate down to 21,6%. Based on the prevalence of stunting (height-for-age), Nusa Tenggara Timur (NTT) is the province with the highest stunting rate, at 35,5%. The highest rates are found in Timor Tengah Selatan (45,2%), followed by Manggarai Barat (40,5%), Sumba Barat Daya (38,8%), Manggarai Barat (38,9%), and Timor Tengah Utara (38,7%). Of the 22 districts and cities in NTT, 12 have stunting prevalence rates below the provincial average. Kupang City has the lowest stunting prevalence in NTT, at 19,2%, followed by Flores Timur (27,4%), Sumba Tengah (25,6%), Nagakeo (30,5%), and Raijua (30,6%) ([Kemenkes, 2023](#)).

Since 2021, the Ministry of Health has launched six pillars of health transformation aimed at improving the overall health system to be more effective, efficient, inclusive, and sustainable in meeting the healthcare needs of the public. One of these pillars is community-based primary health service transformation, which includes empowering health cadres and Posyandu to strengthen community-based health monitoring and preventive services. Posyandu cadres play an essential role in reducing stunting rates. They routinely measure children's weight and height at the Posyandu, recording the data on the "Kartu Menuju Sehat" (KMS/Growth Monitoring Card), which is used to monitor the child's development and detect early signs of stunting ([Mayunita et al., 2024](#); [Meidiawani et al., 2021](#)).

The e-PPGBM application was first launched in 2016 by the Ministry of Health of the Republic of Indonesia. This digital tool was developed to monitor and report the nutritional status of the population, especially children under five, across Indonesia. The application allows Posyandu cadres and health workers to record nutritional data in real time and integrate it at the national level, thereby improving accuracy and speed in detecting nutritional problems such as stunting, malnutrition, or severe malnutrition ([Ngakan et al., 2022](#)).

The use of digital applications in urban and developed areas generally does not face significant challenges. However, this becomes an issue in remote areas, particularly in districts and villages far from technological advances. Several districts in NTT face challenges such as limited access to the internet, computers, tablets, or mobile devices, as well as a lack of human resources, limited education, and the age of Posyandu cadres, which affects their ability to use the application. Although Kupang City has been using the e-PPGBM application since 2016, its effectiveness has not yet been evaluated. To this day, data entry into the e-PPGBM application is entirely done by health workers at the Puskesmas, as no Posyandu cadre possesses sufficient skills to use the application. There has never been any training for Posyandu cadres on using the application, which has led to the Puskesmas taking over the data entry process ([Setyowati & Astuti, 2020](#)).

The accuracy of stunting data is crucial, and the discovery of new cases requires immediate intervention from the central government. Currently, stunting data collection in NTT remains problematic. Posyandu still perform all processes manually, from using weight and height measuring devices to recording and reporting nutritional data ([Sekarwati, 2022](#)). Data validity and quality are major concerns, with errors often occurring in height, weight, and age recordings. Another challenge is that e-PPGBM operators have difficulty reading the handwriting of Posyandu cadres, requiring time to reconfirm the data ([Supriatin & Lindayani, 2021](#)). Puskesmas in Kupang City also often lack stable internet connections, making it difficult to monitor data in real time and leading to delays in nutritional reports.

A survey is needed to assess the role, knowledge, and attitudes of Posyandu cadres in Kupang City in early detection of stunting. Additionally, the response of e-PPGBM operators to the application should be evaluated using the Human-Organization-Technology (HOT) framework ([Sari et al., 2023](#)). This study will examine the relationship between role, knowledge, attitude and length of service of Posyandu cadres. In addition, it will assess how the relationship between human aspects, organization, technology, user knowledge, regulation, and benefits.

This model emphasizes the importance of alignment between three main elements: people, organization, and technology. Human factors include the skills, knowledge, attitudes, and

behaviors of individuals who interact with the system. Organizational factors refer to the organizational context in which the system is implemented (Organizational culture, Management support, Resource allocation). Technological factors focus on the characteristics of the information system (Functionality, Reliability and Security) (Hendri Wijaya, 2023; Sari et al., 2023). This issue is important to investigate, as the effectiveness of the application at Puskesmas needs to be evaluated to identify field challenges.

METHODS

Study sample

This study is a mixed-method research, combining quantitative and qualitative approaches, using a survey method without treatment for the tested group. Data were collected using questionnaires through interviews. The content validity of the instrument was tested through evaluation by the researchers themselves, with the result that the average validity value was 0.89. Followed by construct validity and showed factor loading values that met the criteria. Reliability test was conducted using Cronbach's Alpha coefficient. The results show an α value of 0.85. With validity and reliability values that meet the criteria, this questionnaire is considered valid and reliable for use in this study. The measured variables included the level of knowledge, attitudes, and roles of Posyandu cadres in handling stunting, as well as the responses of e-PPGBM operators regarding the effectiveness and efficiency of the application. These were evaluated based on aspects of knowledge, human, organization, technology, regulation, and benefits. The research was conducted at 11 Puskesmas (community health centers) in Kupang City from May to September 2024. The population and sample consisted of 55 Posyandu cadres and 55 health workers managing e-PPGBM in Kupang City. This study received permission from the local government of Kupang City with research permit number 070/2339/DPMPTSP.4.3/06/2024 and ethical approval from the Research Ethics Committee of Poltekkes Kemenkes Kupang under number LB.02.03/1/0232/2024. Respondents who are willing to sign an inform concern, name and identity are hidden and kept by the researcher as a research secret.

Statistical Analysis

Variables of attitudes, behavior, and roles were assessed using Yes (1) and No (0) responses. The "good" category was defined by a total percentage of responses >50%, and "poor" was defined by <50%. The knowledge, human, organization, technology, regulation, and benefit variables were scored as strongly agree (4), agree (3), disagree (2), and strongly disagree (1). Quantitative data were analyzed using SPSS software. Data homogeneity and normality were assessed with the Shapiro-Wilk test. Correlations between variables were analyzed using Pearson's test for normally distributed data and Spearman's test for non-normally distributed data, with a significance level of $p < 0.05$. Qualitative data from interviews were processed by transcription, coding (open and axial coding), and thematic grouping into tables/matrices, followed by conclusions presented in a narrative form.

RESULTS

Data of Children Under Five Nutritional

We collected data on the number of children weighed from January to June 2024. Data from the 11 Puskesmas in Kupang City showed that Sikumana Puskesmas had the highest rates of stunting and wasting, followed by Oesapa and Oepoi Puskesmas. The lowest rates were found in Kupang Kota and Pasir Panjang Puskesmas. Interestingly, in February 2024, Sikumana Puskesmas experienced an increase in stunting and wasting cases, while Oepoi and Bakunase Puskesmas showed a decrease in stunting cases.

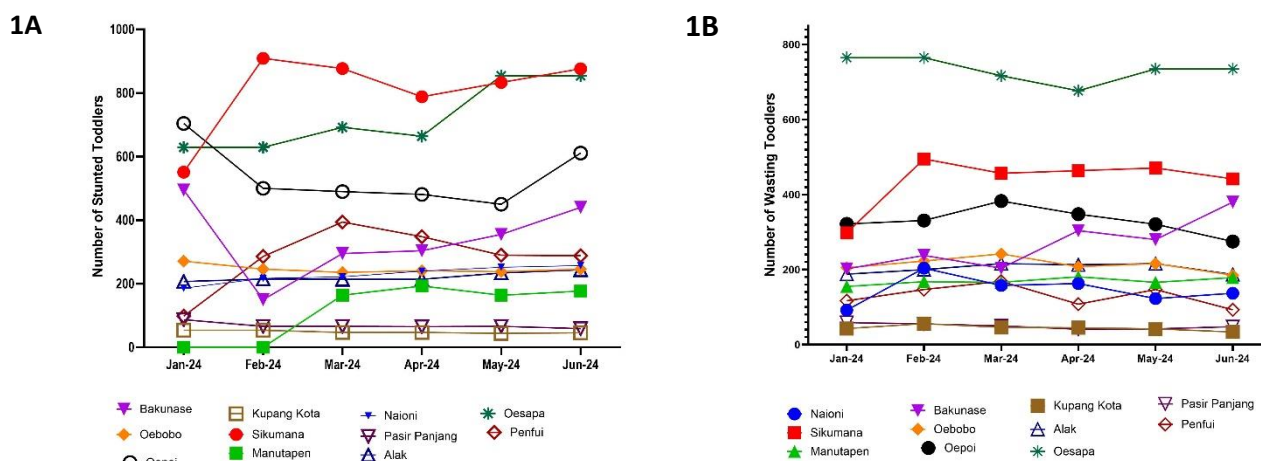


Figure 1. Graph of the number of children under five from January to June 2024. 1A. Number of stunted children. 1B. Number of wasted children. Data from each e-ppBGM Puskesmas.

Knowledge, Attitude, and Role of Cadres

Data collection, questionnaire completion, and interviews were conducted with 55 respondents in Kupang City in July 2024. The respondents' characteristics included age, gender, education level, and occupation. The majority of respondents were aged 41–50 years, accounting for 21 people (38.18%), and those aged 31–40 years made up 27.27% of the respondents. Interestingly, we found that 10 respondents (18.18%) were aged 51–60 years, and 3 respondents (5.45%) were over 60 years old. Most of the respondents were female, totaling 54 (98.18%). Notably, there was one male cadre, which is quite rare in Posyandu in general.

Based on the education level analysis, most respondents were high school (SMA) graduates, totaling 38 people (69.09%), followed by 7 people (12.73%) who had completed primary school (SD), and 6 people (10.91%) who had completed junior high school (SMP). Most respondents had been working for more than 10 years (34 respondents, 61.82%), followed by those with more than 5 years of experience (12 respondents, 21.82%) (Table 1).

Table 1. Data characteristic of respondents

Characteristics	n	%
Age		
20 - 30 years	15	27.27
31 - 40 years	21	38.28
41 - 50 years	11	20.00
51 - 60 years	3	5.45
> 60 years	5	9.09
Range (Min-Max)	35 (26-78)	
Mean $\pm$ SD	45.69 $\pm$ 10.3	
Gender		
Male	1	1.82
Female	54	98.18
Education Level		
Primary School	7	12.73
Junior High School	6	10.91
High School	38	69.09
Bachelor's Degree	4	
Work Experience		
0 - 5 years	9	16.36
>5 - 10 years	12	21.82
>10 years	34	61.82

The measurement of knowledge, attitudes, and roles of cadres was generally categorized as good, as shown in Table 2. The knowledge level was 76.4%, categorized as good. The measurement of cadre attitudes showed that the majority were also categorized as good (78.2%), and the measurement of respondents' roles showed that most were in the good category (98.2%).

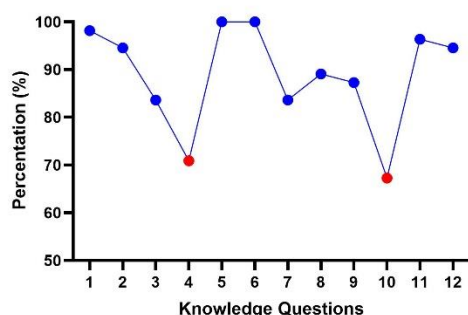
Table 2. Distribution of respondents based on knowledge, attitudes, and roles

Variables	n	%
Knowledge		
Good	42	76.40
Fair	12	21.80
Poor	1	1.80
Attitude		
Positive	55	100
Negative	0	0
Role		
Good	53	96.36
Poor	2	3.64

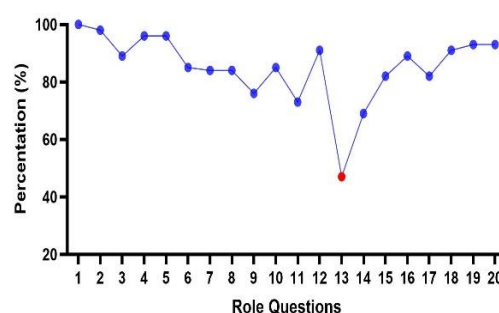
Percentage Distribution of Knowledge, Attitude, and Role of Cadres

The percentage distribution of each variable's questions was measured. For the knowledge variable, most questions were in the "good" category, except for questions 4 and 10, which were categorized as "fair". Question 4 pertained to whether exclusive breastfeeding is sufficient to meet the energy, protein, iron, vitamin D, zinc, and vitamin A needs of children after six months of age. Question 10 related to whether the long-term impacts of stunting include an increased risk of obesity, stroke, hypertension, and diabetes (Figure 2A). For the role variable, we found that, out of 20 questions, only question 13 (regarding whether cadres have ever received a certificate of appreciation) was categorized as "fair" (Figure 2B). This indicates that almost none of the cadres had received an appreciation certificate. For the attitude variable, all responses were in the "good" category, with no respondents selecting "poor" for any questions (Figure 2C).

2A



2B



2C

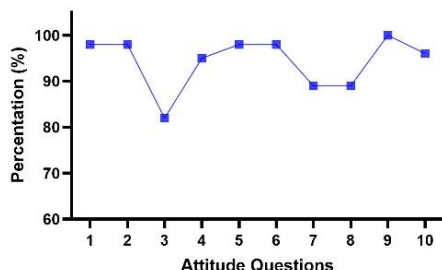


Figure 2. Distribution of Knowledge, Attitude, and Role Questions for Posyandu Cadres. 2A. Distribution of knowledge questions. 2B. Distribution of role questions. 2C. Distribution of attitude questions. Data in descriptive form (n=55)

Correlation Test Between Knowledge, Attitude, and Role Variables of Cadres

Next, a correlation test between variables was conducted, revealing a correlation between knowledge and the length of work experience, as well as a correlation between attitude and the length of work experience. Based on the r value, it is known that the correlation between knowledge ($r=0.036$), attitude ($r=0.054$) with length of work has a strong positive correlation. This means that an increase in length of service is followed by an increase in knowledge and attitude.

Table 3. Correlation test results of knowledge, role, and attitude variables of cadres with education and work experience

Correlation Between Variables		p-value	R-value
Knowledge	Education	0.955	0.585
	Work Experience	0.036 ^{a*}	0.036
Role	Education	0.541	0.408
	Work Experience	0.647	0.568
Attitude	Education	0.849	0.757
	Work Experience	0.034 ^{a*}	0.054

^{a*}Spearman test with $p\text{-value} < 0,05$

Data of e-PPGBM Program Operators Knowledge

We involved 55 e-PPGBM program operators as respondents. Most respondents were aged between 31 and 50 years (90%), predominantly female (91%), and had educational qualifications ranging from a diploma to a master's degree, with most holding a bachelor's degree (45.5%). Nearly all respondents had more than 10 years of work experience (91%), were civil servants (100%), and worked as nutritionists (100%) (Table 4).

Table 4. Distribution of respondents e-PPGBM program operators

Characteristic	n	%
Age		
31 – 40 years	25	45.50
41 – 50 years	25	45.50
51 – 60 years	5	9.00
Range (Min-Max)	(36,51)	
Mean $\pm$ SD	42,45 $\pm$ 5,14	
Gender		
Male	5	9.00
Female	50	91.00
Education Level		
Diploma (D3)	15	27.30
Bachelor's Degree (S1)	25	45.00
Master's Degree (S2)	15	27.30
Work Experience		
< 5 years	5	9.00
>5 years	-	
>10 years	50	91.00
Employment Status		
Civil Servant (PNS)	55	100.00
Contract	-	
Posyandu Cadre	-	
Profession		
Nurse	-	
Midwife	-	
Pharmacist	-	
Laboratory Analyst (TLM)	-	
Nutritionist	55	100.00

We conducted an evaluation analysis of e-PPGBM usage, measuring responses on aspects of human, organization, technology, user knowledge, regulation, and benefits. The results are shown in Table 5, with data presented in total scores. The human aspect received a response of "agree" (61.54%) and "strongly agree" (29.49%), while the organization aspect received "agree" (55.83%) and "strongly agree" (42.86%). For the technology aspect, respondents answered "agree" (47.27%) and "strongly agree" (49.40%). User knowledge received "agree" (52.27%) and "strongly agree" (45.45%). The regulation aspect showed "agree" (49.09%) and "strongly agree" (45.44%), and the benefits aspect showed "agree" (50%) and "strongly agree" (44.32%). Overall, there were still a few "disagree" and "strongly disagree" responses, although the percentages were very small.

Table 5. Total score of variables

Variables	Total Score	Percentage (%)
Human Aspect		
Strongly Agree	460	29.49
Agree	940	61.54
Disagree	100	6.41
Strongly Disagree	40	2.56
Organization Aspect		
Strongly Agree	660	42.86
Agree	860	55.83
Disagree	20	1.30
Strongly Disagree	0	0.00
Technology Aspect		
Strongly Agree	1080	49.4
Agree	1040	47.27
Disagree	80	3.64
Strongly Disagree	0	0.00
User Knowledge Aspect		
Strongly Agree	400	45.45
Agree	460	52.27
Disagree	20	2.27
Strongly Disagree	0	0.00
Regulation Aspect		
Strongly Agree	500	45.45
Agree	540	49.09
Disagree	40	3.64
Strongly Disagree	20	1.82
Benefits Aspect		
Strongly Agree	780	44.32
Agree	880	50.00
Disagree	60	3.41
Strongly Disagree	40	2.27

Table 6. Average score of variables

No	Variables	Mean	Success Category
1	Human Aspect	3.18	Good
2	Organization Aspect	3.42	Very Good
3	Technology Aspect	3.83	Very Good
4	User Knowledge Aspect	3.41	Very Good
5	Regulation Aspect	3.36	Very Good
6	Benefits Aspect	3.36	Very Good
	Total Mean	3.43	Very Good

The level of success in accepting the e-PPGBM system was measured using descriptive statistics, such as the mean. The mean score was calculated by summing all the data values and

dividing by the total number of respondents. Based on the table above, the average score for all variables using the HOT Fit method was 3.43. That result indicating that the level of system acceptance for e-PPGBM was categorized as very good. Only the human aspect was categorized as good, compared to the other variables, due to a score of 2.64 for the question regarding cadre use of the e-PPGBM application (Table 6).

Correlation Test Between Variables of e-PPGBM Operators' Response to Application Usage

The correlation analysis between variables showed that all variables were correlated positif with each other. A very strong correlation was found between knowledge and technology and regulation (r -values = 0,91-0,99). A strong correlation was found between knowledge and human, human and regulation, organization and technology, technology and regulation, and regulation and benefits (r -values = 0,71-0,90) (Table 7). Positif corelation means that an increase in one variabel are followed by an increase in others.

Table 7. Correlation between variables

	Variables	r	Correlation Level	p-value	Conclusion
Knowledge	Human Aspect	0.722	Strong	0.000 ^{a*}	In correlation
	Organization	0.568	Moderate	0.000 ^{a*}	In correlation
	Technology	0.924 [#]	Very Strong	0.000 ^{a*}	In correlation
	Regulation	0.937 [#]	Very Strong	0.000 ^{a*}	In correlation
	Benefits	0.908 ^{\$}	Strong	0.000 ^{a*}	In correlation
Human	Organization	0.405	Moderate	0.002 ^{a*}	In correlation
	Technology	0.607	Moderate	0.000 ^{a*}	In correlation
	Regulation	0.730 ^{\$}	Strong	0.000 ^{a*}	In correlation
	Benefits	0.517	Moderate	0.000 ^{a*}	In correlation
Organization	Technology	0.730 ^{\$}	Strong	0.000 ^{a*}	In correlation
	Regulation	0.317	Weak	0.000 ^{a*}	In correlation
	Benefits	0.566	Moderate	0.000 ^{a*}	In correlation
Technology	Regulation	0.781 ^{\$}	Strong	0.000 ^{a*}	In correlation
	Benefits	0.900 ^{\$}	Strong	0.000 ^{a*}	In correlation
Regulation	Benefits	0.801 ^{\$}	Strong	0.000 ^{a*}	In correlation

^aSpearman test, *p-value < 0,05, #-very strong correlation, \$-strong correlation.

Interview Results

The e-PPGBM application is managed by nutritionists at the Puskesmas and has not yet been transferred to the Posyandu

- *"Managing e-PPGBM requires training, as there are cadres who do not know how to use Android" (respondent 21)*
- *"Negative consequences may arise, as data may be incorrectly input by cadres who do not know how to fill it in" (respondent 31)*
- *"There has been no training for cadres; not all cadres have smartphones or laptops. The age of the cadres also influences this, as many are already elderly" (respondent 14)*

From the 55 respondents we interviewed, we concluded that the e-PPGBM application had not been transferred to Posyandu because some staff at the Puskesmas and cadres still do not fully understand how to use the application. Another factor is the lack of supporting infrastructure, such as devices (laptops, computers) and internet access for the e-PPGBM application. In addition, local government policy plays a role in the use of this application in health facilities and communities.

Application Use Challenges

- *"Internet connectivity is often disrupted, and we frequently use personal data packages" (respondent 34)*
- *"The application is often slow and undergoes too much maintenance, hindering health workers from inputting child data" (respondent 28)*

We concluded that the most common challenge in using the application is internet connectivity when accessing it. The Wi-Fi network used to input e-PPGBM data relies on Puskesmas Wi-Fi, but at times, personal internet from staff or cadres is also used. Most respondents indicated that the major issue with the e-PPGBM application is network access, along with the lack of synchronization with other applications (e.g.: e-Kohort) and the inability to pull data from the application.

DISCUSSION

Overall, the results of this study show that stunting and wasting rates in Kupang City remain quite high, particularly in Sikumana Puskesmas, which recorded the highest cases in February 2024, with 909 children stunted and 492 children wasted. Interestingly, Oesapa Puskesmas had the highest number of wasted children compared to other Puskesmas. There were no issues found in the assessment of the Posyandu cadres' attitudes, behavior, and roles, as they were generally categorized as good. There was a correlation between knowledge and the length of time cadres had worked, as well as between attitude and the length of time cadres had worked. The success rate of the e-PPGBM system, measured across all variables (human, organization, technology, knowledge, regulation, and benefits), was categorized as very good. Furthermore, in the evaluation of e-PPGBM operators, all variables were found to be correlated with each other.

Posyandu cadres are members of the community selected and trained to lead Posyandu activities in their respective areas. They are not professional healthcare workers but volunteers who play a crucial role in supporting basic healthcare services at the village or sub-district level ([Putu Okta Diwian Jaya Putra et al., 2024](#)). Some of the roles of the cadres in reducing stunting rates include educating pregnant women and mothers with young children on the importance of proper nutrition, educating the community on the importance of maintaining a clean environment, access to clean drinking water, and the use of proper sanitation facilities to prevent infectious diseases that can worsen a child's nutritional status. Cadres also engage in community nutrition education, emphasizing the importance of proper nutrition during pregnancy and the first 1,000 days of a child's life ([Alin Kurnianti, 2022](#)). Cadres monitor children's growth by measuring weight, height, and head circumference regularly to detect early signs of stunting. They also monitor the health of pregnant women, ensuring that they attend regular check-ups at the Posyandu or Puskesmas ([Yuliana et al., 2024](#)).

The knowledge, attitudes, and roles of Posyandu cadres have been previously studied, and it has been proven that there is a positive correlation between these variables and the early detection of stunting ([Nurhayati et al., 2023](#); [Rasmaniar et al., 2022](#); [Siswati et al., 2022](#); [Sufri et al., 2023](#)). Our study showed that the knowledge, attitudes, and roles of Posyandu cadres in Kupang City were in the good category. Notably, the study found that the length of time cadres had worked was related to their knowledge and attitudes regarding early stunting detection. Years of experience provide cadres with opportunities to participate in various trainings, socialization programs, and practical fieldwork. More experienced cadres tend to have better knowledge about various health issues, including stunting, as they are more frequently exposed to new information through training programs and direct field experience. Work experience also shapes the attitude of the cadres in serving the community. The longer cadres are involved in Posyandu activities, the more familiar they become with interacting with the community and addressing various health challenges. Positive attitudes among the cadres often stem from a deeper understanding of their important role in preventing public health issues, including stunting. A study in North Lampung showed that experienced cadres tend to have a positive attitude toward stunting prevention and are highly motivated in performing their duties ([Nurhayati et al., 2023](#); [Sewa et al., 2019](#); [Sufri et al., 2023](#)).

e-PPGBM is an electronic system used by the Indonesian government to record and report the nutritional status of children more efficiently, quickly, and accurately. This system, managed by the Ministry of Health the Republic of Indonesia, is designed to support community-based monitoring of the nutritional status of children under five at the Posyandu and Puskesmas levels. The e-PPGBM system is used to record the nutritional data of children aged 0–59 months ([Hendri](#)

Wijaya, 2023). The data recorded include weight, height, age, and other parameters related to a child's nutritional status. Data is recorded in real time, allowing health workers to plan nutrition interventions more accurately. The system supports programs aimed at improving children's nutrition, including interventions to address stunting and malnutrition. This data can then be monitored at the sub-district, district, and national levels for monitoring and evaluation (Hendri Wijaya, 2023; Sari et al., 2023).

The HOT (Human, Organization, Technology) method is a commonly used approach to assess the acceptance of an information system. One of the strengths of this method is that it considers the three main elements (human, organization, and technology) simultaneously, providing a more comprehensive understanding of the factors influencing the acceptance of the information system. By emphasizing the human aspect, this method helps in understanding the needs and expectations of users, which is crucial for ensuring successful system adoption and use. The method also takes into account the organizational structure and culture, which can influence system acceptance. This helps identify potential resistance or support from various parts of the organization (Sari et al., 2023).

In addition to using the HOT method, we also included aspects of regulation and benefits. The multidimensional approach we used is expected to provide a more comprehensive understanding of system acceptance. The human aspect is a key element in the success of an information system. The HOT method places particular focus on how users interact with the system, helping to identify potential issues related to user needs, ease of use, and user adaptation to the new system. Interestingly, our study showed that the human aspect was the only one categorized as good (3,18) while the other aspects were categorized as very good. Our analysis found that the lowest score (2,64) was for question number 7, which asked about the involvement of cadres in using the e-PPGBM application. This indicates that most operators disagreed with the idea of transferring the e-PPGBM application to Posyandu cadres.

Interviews with 11 Puskesmas in Kupang City revealed that the e-PPGBM application had not been transferred to Posyandu. Some challenges in the process included the limited knowledge of both Puskesmas staff and cadres on how to use the application, as well as inadequate supporting infrastructure, such as devices (laptops, computers) and network access for using the e-PPGBM application.

In the development of technology, the digital divide remains a challenge, including initiatives for the use of the e-PPGBM application. This divide can be bridged by improving internet access and digital skills among staff and cadres to implement more effective policies. Another finding was that, according to one Puskesmas, local government policy plays a role in the use of this application in health facilities and communities. Effective policy is crucial to overcoming challenges related to digital capabilities and infrastructure (Fatimah et al., 2023). Despite progress, challenges such as inter-agency coordination and the quality of human resources continue to affect the overall success of the e-PPGBM initiative (Hendri Wijaya, 2023). To achieve more effective application implementation, socialization and training supported by clear, easily understood guidelines are important (Firmandayu & Elfaki, 2023).

The weaknesses of the multidimensional method we used include that the assessment of the human aspect heavily depends on individual perceptions, which can vary between users. This can lead to bias in the analysis if there is no accurate method for measuring users' perceptions and preferences objectively. Many variables in the HOT method are qualitative, such as organizational culture and user satisfaction, which are difficult to measure quantitatively. This can make conclusions less precise and require further interpretation. Because this method considers many aspects, there is a risk that the evaluation may become too broad and not focus on specific issues that need immediate resolution, especially if system implementation requires quick adjustments.

Although the e-PPGBM application holds promise for improving public policy effectiveness in Indonesia, many challenges remain, such as infrastructure and human resources issues, including the lack of understanding among staff and cadres in using the application and infrastructure problems like device availability and network access when using the e-PPGBM application. A study by Sari et al. (2023), found that there are still challenges in the implementation of the e-PPGBM system, such as system errors, where data already entered into

the application is often lost, difficulties accessing the system, some users delaying data entry into the system, and a lack of firm organizational action against users who frequently delay data entry.

Our study did not find technical difficulties other than internet access issues when using the application. The use of the e-PPGBM application at the Posyandu level is seen as important for obtaining accurate data, but it is still very difficult to implement in Kupang City due to human resources and infrastructure limitations, such as computer devices and internet connections. The re-entry of Posyandu data by operators into the e-PPGBM application at the Puskesmas level is one of the reasons for the inaccuracy of stunting data in Kupang City. There is a need for Posyandu cadres who have basic technological skills to operate the e-PPGBM system. Local government attention is still needed to improve infrastructure (computer facilities and internet networks) both at the Puskesmas and Posyandu. Recruitment of Posyandu cadres who have just graduated from high school or university is a consideration to get human resources who can adapt to technology.

CONCLUSION

Data recording at the Posyandu level in Kupang City is still done manually, and Posyandu cadres have not yet played a role in using the e-PPGBM application. However, the evaluation of cadres' knowledge, roles, and attitudes is categorized as good and shows a correlation with the length of work experience. The e-PPGBM application is entirely managed by nutrition staff at the Puskesmas. The evaluation of system acceptance showed that the organization, technology, knowledge, regulation, and benefits variables were categorized as very good. The human aspect was categorized as good, with some concerns raised regarding the lack of agreement on Posyandu cadres' involvement in using the e-PPGBM application. A correlation was found between all variables of the operator's response to the use of the application, a very strong correlation was found between knowledge with technology and regulation and a strong correlation was found between knowledge with people, people with regulation, organization with technology, technology with regulation, and regulation with benefits.

Author's Contribution Statement: Irfan contributed to the study's concept, design, literature search, experimental work, data acquisition, and analysis. Fitry Handayani and Riny Pujiyanti assisted with experimental studies and data acquisition. Syaputra Artama managed the literature search, data analysis, and statistical analysis. All authors participated in manuscript preparation, with I responsible for editing and review.

Conflicts of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Source of Funding Statements: The research was funded by Simlitabkes Poltekkes Kemenkes Kupang in 2024 with Number DP.04.03/F.XXXVII/1072/2024 Basic Research scheme for Higher Education Excellence (PDUPT).

Acknowledgments: We would like to thank the heads of Puskesmas Bakunase, Puskesmas Oebobo, Puskesmas Oepoi, Puskesmas Kupang Kota, Puskesmas Sikumana, Puskesmas Manutapen, Puskesmas Naioni, Puskesmas Pasir Panjang, Puskesmas Alak, Puskesmas Oesapa and Puskesmas Penfui. who have supported this research, to all respondents in this case Posyandu cadres and e-ppBGM application managers who have been willing to be interviewed and provide answers.

REFERENCES

Alin Kurnianti, D. (2022). Evaluasi Program Pmt-P Pada Ibu Hamil Kekurangan Energi Kronik Di Puskesmas Pekalongan Selatan. In *Sport and Nutrition Journal*. 4(2). 1-17. Retrieved from <https://journal.unnes.ac.id/sju/spnj/article/view/53852>

- Fatimah, H. S., Sriningsih, S., Pascayanti, Y., & Yusuf, F. (2023). Digital Divide Solutions and Public Service Policy Implementation in Indonesia after the Covid-19 Pandemic. *Journal of Economics, Finance and Management Studies*, 6(8), 3801–3818. <https://doi.org/10.47191/jefms/v6-i8-30>
- Firmandayu, N., & Elfaki, K. E. (2023). The Electronic Government Policy-Based Green Constitution Towards Good Governance. *Journal of Sustainable Development and Regulatory Issues (JSDERI)*, 1(2), 108–121. <https://doi.org/10.53955/jsderi.v1i2.11>
- Hendri Wijaya, J. (2023). E-Government in Indonesia: Policy Review and Implementation of Jokowi's Government. *The Journalish: Social and Government*, 4(3), 302–309. <https://doi.org/10.55314/tsg.v4i3.563>
- Kemenkes. (2023). Hasil Survei Status Gizi Indonesia (SSGI) 2022. *Kemenkes*, 1–7. Retrieved from <https://layanandata.kemkes.go.id/katalog-data/ssgi/ketersediaan-data/ssgi-2022>
- Mayunita, A., Romadhona Haque, B., Anggraini, L., & Putri Rahmadhena, M., (2024). Penyuluhan Stunting dan Pencegahannya di Posyandu Asoka I, Dusun Tegalasem, Sindangsari Karawang. *Jurnal AbdimasSains*, 1(2), 50–59. Retrieved from <http://www.jas.stikep-ppnijabar.ac.id/index.php/jas/article/download/9/8>
- Meidiawani, M., Adlia Syakurah, R. (2021). Kepuasan Pengguna Aplikasi E-ppGBM Berdasarkan Kualitas Sistem Model Kesuksesan DeLone-McLean. *PREPOTIFJurnal Kesehatan Masyarakat*, 5(1), 96–02. Retrieved from <https://journal.universitaspahlawan.ac.id/index.php/prepotif/article/view/1323>
- Ngakan, D., Wahyu, G., Putra, M., Nurika, G., (2022). *Evaluasi Penerimaan Pengguna Terhadap Sistem Informasi E-PPGBM Di Kabupaten Jember*. Retrieved from <https://repository.unej.ac.id/xmlui/handle/123456789/105920>
- Nurhayati, S., Anak, D. K., Keperawatan, A., & Rebo, P. (2023). *Optimalisasi Peran Kader Posyandu Dalam Pelayanan Stunting*. 7(1). Retrieved from <https://akper-pasarrebo.e-journal.id/nurs/article/view/135>
- Putu Okta Diwian Jaya Putra, I., Tri Purnami, C., Kartini, A.,(2024). Validitas Dan Reliabilitas Instrumen Gabungan Model Evaluasi Sistem Informasi Gizi Terpadu. *Jurnal Manajemen Kesehatan Indonesia*. 12(1), 79-89. Retrieved from <https://ejournal.undip.ac.id/index.php/jmki/article/view/62911>
- Rasmaniar, R., Nurlaela, E., Ahmad, A., & Nurbaya, N. (2022). Peer Education through Empowerment of Youth Posyandu Cadres on Adolescent Knowledge, Attitudes, and Behaviors about the Benefits of Nutrition in Stunting Prevention: A Quasi- Experimental Research. *Health Information: Jurnal Penelitian*, 14(1), 76–88. Retrieved from <https://myjurnal.poltekkes-kdi.ac.id/index.php/hijp/article/view/498>
- Sari, W., Hidayat Koniyo, M., & Olii, S. (2023). *Evaluasi Penerapan Sistem Informasi E-PPGBM Menggunakan Metode HOT FIT Model*. 3(2). Retrieved from <https://ejurnal.ung.ac.id/index.php/diffusion/article/view/20084>
- Sekarwati, L. (2022). Pengaruh Aplikasi Berbasis Android Ayo Dedis Untuk Peningkatan Pengetahuan Gizi Seimbang Terhadap Stunting Pada Ibu Hamil. *Media Husada Journal Of Nursing Science*, 3(2), 132–142. <https://doi.org/10.33475/mhjns.v3i2.86>
- Setyowati, M., & Astuti, R. (2020). Pelatihan Pemetaan Status Gizi Balita Bagi Kader Posyandu Balita Di Kecamatan Ngaliyan Kota Semarang. *Jurnal Masyarakat Mandiri*, 4(6), 1185–1198. Retrieved from <https://journal.ummat.ac.id/index.php/jmm/article/view/3055>
- Sewa, R., Tumurang, M., Boky, H. (2019). Posyandu Di Wilayah Kerja Puskesmas Bailang Kota Manado. *Jurnal KESMAS*. 8(4). Retrieved from <https://ejournal.unsrat.ac.id/index.php/kesmas/article/view/23968>
- Siswati, T., Iskandar, S., Pramestuti, N., Raharjo, J., Rialihanto, M. P., Rubaya, A. K., & Wiratama, B. S. (2022). Effect of a Short Course on Improving the Cadres' Knowledge in the Context of Reducing Stunting through Home Visits in Yogyakarta, Indonesia. *International Journal of Environmental Research and Public Health*, 19(16). <https://doi.org/10.3390/ijerph19169843>

- Sufri, S., Nurhasanah, Jannah, M., Dewi, T. P., Sirasa, F., & Bakri, S. (2023). Child Stunting Reduction in Aceh Province: Challenges and a Way Ahead. *Maternal and Child Health Journal*, 27(5), 888–901. <https://doi.org/10.1007/s10995-023-03601-y>
- Supriatin, E., & Lindayani, L. (2021). Factors Related to Behavior in Implementing Patient Safety in Nurses. *Dunia Keperawatan: Jurnal Keperawatan Dan Kesehatan*, 9(2), 55. <https://doi.org/10.20527/dk.v9i1.8257>
- Yuliana, D., Sukma Tiara, D., Lestari, M., Maulidya, N. F., Chaerani, S., Oleifera, S. K., & Noerfitri, N. (2024). Intervensi Gizi Sebagai Upaya Pencegahan Anemia Pada Remaja Putri Di Wilayah Kerja Puskesmas Pekayon Jaya Kota Bekasi. *Jurnal Mitra Masyarakat (JMM)*, 5(1), 17–23. <https://doi.org/10.47522/jmm.v5i1.184>

Supplementary Data

No.	Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
Human					
1.	e-PPGBM is easy to use by the staff	15	45	-	-
2.	e-PPGBM allows nutrition staff to interact flexibly	15	30	10	-
3.	e-PPGBM facilitates daily work for staff in data collection	20	35	-	-
4.	e-PPGBM supports tasks in improving performance	20	35	-	-
5.	e-PPGBM helps in decision-making processes	20	35	-	-
6.	The information system provided by e-PPGBM is of good quality	20	30	-	5
7.	Cadres also play a role in filling out the e-PPGBM application (If not, please explain: ...)	25	30	15	5
Organization					
8.	The management of the Puskesmas supports the utilization of e-PPGBM	25	30	-	-
9.	The work unit supports the use of e-PPGBM	25	30	-	-
10.	The work unit encourages the use of e-PPGBM	25	30	-	-
11.	e-PPGBM has technical support from the Puskesmas/Health Office	25	30	-	-
12.	The management of the Puskesmas/Health Office provides training on e-PPGBM	15	40	-	-
13.	The Puskesmas has adequate network facilities to access e-PPGBM	20	30	5	-
14.	The Puskesmas management has a dedicated computer to access e-PPGBM	30	25	-	-
Technology					
15.	e-PPGBM improves communication between data sets	35	20	-	-
16.	e-PPGBM saves time in presenting information	35	20	-	-
17.	e-PPGBM speeds up the presentation of stunting information	35	20	-	-
18.	e-PPGBM provides up-to-date data	30	25	-	-
19.	e-PPGBM contains the required comprehensive data	25	30	-	-
20.	e-PPGBM has high access speed	15	30	5	-
21.	e-PPGBM provides relevant information	25	25	5	-
22.	e-PPGBM provides useful cross-sectoral information on stunting	25	30	-	-
23.	The e-PPGBM technology provides accurate information on stunting	25	30	-	-
24.	The information presented by e-PPGBM is complete	20	30	5	-
Knowledge of e-PPGBM Users/Operators					

No.	Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
25.	I understand computer technology	25	25	5	-
26.	I understand internet technology	25	25	5	
27.	I understand e-PPGBM	25	25	5	
28.	I know the benefits of e-PPGBM	25	30	-	-
29.	I know the advantages for e-PPGBM users	25	30	-	-
30.	I know the benefits for the Puskesmas/ Health Office from using e-PPGBM	25	30	-	-
Regulation					
31.	There is a decree from the Puskesmas/ Health Office head regarding e-PPGBM	15	25	10	5
32.	There is involvement from the Ministry of Health in the development of e-PPGBM	30	25	-	-
33.	There is regular monitoring and evaluation presented in monthly/quarterly mini workshops	25	30	-	-
34.	There is advocacy for e-PPGBM analysis results at the sub-district forum level	25	30	-	-
35.	The Health Office/Ministry of Health is involved in the development of e-PPGBM	30	25	-	-
Benefits					
36.	e-PPGBM is useful for services	25	30	-	-
37.	e-PPGBM presents complete information	25	30	-	-
38.	e-PPGBM is easy to operate	25	30	-	-
39.	e-PPGBM improves Puskesmas performance	25	30	-	-
40.	e-PPGBM improves Puskesmas services	25	30	-	-
41.	e-PPGBM increases community satisfaction in addressing stunting	15	25	10	5
42.	e-PPGBM enhances stunting prevention	25	20	5	5
43.	There is an intervention on nutritional issues (stunting, wasting, underweight) based on e-PPGBM reports	30	25	-	-
44.	e-PPGBM impacts the improvement of stunted children's nutritional status	30	20	-	5