Healthcare Providers' Understanding and Performance in Stunting Prevention: A Study from Rural and Urban Primary Healthcare Facilities in Indonesia

Ramadhaniyati Ramadhaniyati[1,2,*], Lilis Lestari[1,2], Ruka Saito[3] and Akiko Tsuda[3]

[1]*Division of Health Sciences, Graduate School of Medical Sciences, Kanazawa University, Ishikawa, Japan*

[2]*Department of Child and Maternity Nursing, ITEKES Muhammadiyah Kalimantan Barat, Pontianak, Indonesia*

[3]*Faculty of Health Sciences, Institute of Medical, Pharmaceutical and Health Sciences, Kanazawa University, Ishikawa, Japan*

Abstract: *Background*: Reducing stunting globally remains inadequate, with regional disparities persisting between rural and urban areas. This study aims to compare the knowledge and performance of healthcare providers (HCPs) in rural and urban primary healthcare facilities regarding the implementation of stunting prevention using a quantitative approach. It also explores further rural HCPs' challenges through a qualitative study.

Methods: A cross-sectional quantitative study involved 557 primary HCPs from rural and urban Indonesia from July to October 2023. Data were collected using a self-administered structured questionnaire. Descriptive statistical analysis and the Chi-Square test were conducted with IBM SPSS version 29. Additionally, a descriptive qualitative study was conducted in a rural area in January 2024, employing purposive sampling and semi-structured interviews with eight primary HCPs, which were analyzed using content analysis.

Results: Compared to their urban counterparts, rural HCPs showed less knowledge of nutrition ($p = 0.007$) and stunting ($p = 0.013$), higher socio-cultural values that impact stunting ($p = 0.009$), ineffective implementation of stunting prevention ($p = 0.013$), and higher barriers in implementing stunting prevention ($p < 0.001$). Qualitative findings further revealed that weak awareness, capacity issues, and socio-cultural challenges constituted significant obstacles for rural HCPs.

Conclusion: This study underscores the need for policymakers to prioritize the development of targeted intervention programs that enhance rural HCPs' capacity in nutrition, cultural competency, advocacy, and communication. Policymakers must formulate effective policies and standardized, easy-to-implement guidelines for stunting prevention specifically to rural primary care settings.

Keywords: Healthcare disparities, healthcare providers, Indonesia, primary healthcare, rural health, stunting.

1. INTRODUCTION

Reducing childhood stunting remains a major global health priority. Although stunting cases worldwide have declined over the past few years, the progress remains insufficient to meet international goals. Southeast Asia continues to face a considerable burden, with rates higher than both the global average and the *World Health Organization* (WHO) goals of under 20% by 2025 [1, 2]. In Indonesia, stunting has been a major child health issue that contributes significantly to the regional burden. Although national strategies and stunting reduction programs are in place, progress remains uneven between rural and urban areas. Rural areas face greater challenges, which keep stunting rates high, while urban areas show greater progress in their attempts to reduce stunting [3]. Tailored interventions and comprehensive strategies are essential to address these disparities in rural areas.

Primary healthcare facilities such as *Puskesmas* (primary healthcare centers), *Polindes* (village birth huts), and *Posyandu* (integrated service posts) are first-level health services in the community that focus on preventive care and community outreach. The essential maternal and child health services provided in these facilities include antenatal, intranatal, and postnatal care, growth monitoring, and immunizations [4]. Effective stunting reduction efforts require adequate healthcare provider capacity and competence. However, research in low and middle-income countries indicates that the quality of maternal and child nutrition services at the *Puskesmas* level is low, with HCPs lacking skill in assessing nutritional status and counselling expectant mothers and children [5]. Similarly, other studies have shown that limited nutrition knowledge, workforce shortages, insufficient time, communication issues, and low prioritization of child nutrition [6] hinder HCPs' ability to support mothers and children. In rural areas, HCPs' limited nutritional knowledge is exacerbated by limited access to training, communities with strong cultural beliefs, and

*Address correspondence to this author at the Jl. Sei. Raya Dalam Gg. Ceria V No.10, Pontianak, Indonesia; Tel: +6282124360722;
E-mail: ramadhaniyati@stikmuhptk.ac.id

geographical barriers [7-9], making it difficult for them to update their nutritional knowledge, apply culturally sensitive nutrition practices, and provide uniform nutrition information. Targeted programs and support systems are needed to enhance HCPs' capacity in delivering effective nutrition and health services.

While numerous studies have explored broader issues in the implementation of stunting prevention and management, few have examined differences in understanding, performance, and challenges faced by primary HCPs between rural areas with the highest stunting rates and urban areas with the lowest stunting rates. To address these gaps, this study aimed to:

1. Compare rural and urban primary HCPs' understanding of nutrition and stunting, perceptions of socio-cultural values that impact stunting, and perspectives on stunting prevention implementation and the barriers they face, using quantitative research.

2. Explore, through qualitative research, in-depth, the situations faced by rural HCPs in implementing stunting prevention.

We acknowledge that these findings may not be universally applicable, especially beyond rural primary healthcare contexts; however, understanding these regional disparities and the challenges encountered by rural HCPs is crucial for formulating targeted strategies to combat stunting, ultimately decreasing rates at national, regional, and global levels. The findings also offer valuable insights for other regions and countries facing the same problems.

2. MATERIALS AND METHODS

2.1. Study Design, Settings, and Participants

In the initial phase, a quantitative cross-sectional study was conducted from July to October 2023 in rural and urban areas of West Kalimantan Province, Indonesia. Locations included Melawi district, with the highest stunting rate (44.1%), and Pontianak City, the provincial capital, with the lowest rate (19.7%), according to the 2022 Indonesian Nutritional Status Survey [10].

The study included HCPs at Puskesmas-doctors, nurses, midwives, nutritionists, sanitarians, and public health professionals-who were involved in stunting prevention during the first 1,000 days of life. Multi-stage cluster sampling was used to select target Puskesmas in each area, followed by simple random sampling to select HCPs within them [11]. From a population of 1,059 in 26 Puskesmas, the sample size was calculated using a standard formula for cross-sectional studies, based on a 95% confidence level (z = 1.96), 5% precision, and an expected prevalence of 50%, resulting in a minimum sample size of 384 (Formula 1) [12, 13]. To achieve a 50% response rate, we distributed 821 questionnaires to the target respondents in both rural and urban areas.

$$n = \frac{Z^2 P(1-P)}{d^2} = \frac{(1.96)^2 \times 0.5(0.5)}{0.05^2} = 384$$

Formula 1. Sample size

In the second phase, descriptive qualitative research was conducted in January 2024 in the Melawi district to further clarify the quantitative findings and deepen the understanding of the challenges HCPs faced in this area. Purposive sampling was used to select participants from various professions, ensuring diverse perspectives [14]. Eight HCPs were chosen based on data saturation principles [15], including two midwives, a nutritionist, a sanitarian, a public health professional, and three village midwives.

2.2. Instrument

Quantitative data were collected using a self-administered structured questionnaire developed by the research team based on various related references [16-19]. It included six sections: (1) HCPs characteristics (profession, gender, education, religion, ethnicity, and nutrition training); (2) knowledge of maternal and child nutrition (12 True/False questions); (3) knowledge of stunting (10 True/False questions); (4) perceptions of social norms and cultural values affecting stunting (8 agree/disagree questions); (5) perspectives on stunting prevention implementation (15 always/not-always questions); and (6) barriers to implementing stunting prevention (10 agree/disagree questions).

Five HCPs and three public maternal and child health experts in Indonesia assessed the questionnaire's content validity. HCPs rated item clarity on a scale of 1 (not clear) to 4 (very clear), yielding an average score of 3.96, indicating high clarity. Experts determined a content validity index (S-CVI) of over 0.97 for clarity and relevance, confirming the questionnaire's suitability for the study's focus [20]. Furthermore, a pilot study with 51 HCPs ensured comprehension among participants.

For the qualitative study, a semi-structured interview guide with open-ended questions was developed to direct interviews systematically. A pretest was conducted with a midwife from rural Puskesmas before the main study. The interview began with, "How is the implementation of stunting prevention in your Puskesmas?" Follow-up questions addressed coordination, strategies, challenges, needs, and socio-cultural values affecting stunting prevention efforts.

2.3. Data Collection Procedure

In the quantitative study, researchers distributed the questionnaire to target participants after obtaining necessary permissions and coordinating with Puskesmas heads. All respondents were informed verbally and in writing about the study's purpose, questionnaire instructions, and principles of anonymity, confidentiality, and voluntariness. Those who agreed signed a consent form.

For the qualitative research, semi-structured interviews were conducted with eight participants, each lasting about 60 minutes, and field notes documented additional details. Participants were informed about the study's purpose, interview procedures, data confidentiality, and their right to withdraw at any time. All provided written consent, and interviews were conducted in Bahasa, participants' primary language.

2.4. Data Analysis

Quantitative data analysis employed descriptive statistics to summarize the data in frequencies and percentages. Statistical differences between study area groups were assessed using the Chi-Square test, considering p-values < 0.05 as significant. To evaluate data normality, the Kolmogorov-Smirnov test was used, and the result indicated non-normality ($p < 0.05$). Furthermore, because the expected category outcome was dichotomous, the optimal cut-off point was determined using the median, the Receiver Operating Characteristic (ROC) curve with an Area Under the Curve (AUC) of 100%, and the Youden Index. Scores below the thresholds indicate low knowledge, low agreement, ineffective role, and fewer barriers, while higher scores indicate the opposite. All analyses were supported by IBM SPSS version 29 [21].

The qualitative phase of this study followed the quantitative analysis to clarify findings that required further clarification. Qualitative data were initially transcribed in Bahasa and meticulously translated into English to preserve the original context. Content analysis was employed to summarize HCPs' perspectives into key categories [14, 22]. The analysis began with coding to label the specific meaning of an idea. The codes were examined, grouped into sub-categories, and then combined into broader categories. Trustworthiness was confirmed to ensure data accuracy. Triangulation was applied to cross-check responses to enhance credibility, while member checking allowed HCPs to confirm the accuracy of interpretations. To ensure transparency and reliability, the experts in the qualitative study conducted a detailed audit at each stage of data collection and analysis [23]. After analyses in both research stages were completed, we used qualitative data to interpret and elaborate on specific quantitative results, and this integration is reflected in the discussion section.

3. RESULTS

3.1. Phase 1. Quantitative Findings

3.1.1. Characteristics of Healthcare Providers

Of 821 distributed questionnaires across study areas, 557 were returned, yielding a 68% response rate, with 213 from rural and 344 from urban areas. In both settings, midwives (44.1% rural, 32.3% urban) and nurses (41.3% rural, 24.4% urban) were the predominant HCPs. However, other professionals, such as doctors, nutritionists, sanitarians, and public health professionals, were less represented in rural areas. HCPs in rural areas (39.4%) received less training in maternal and child nutrition than urban HCPs (52.6%) (Table **1**).

3.1.2. Knowledge of Nutrition for Pregnant Women and Children under Two Years, and Knowledge of Childhood Stunting

In both study areas, HCPs had the lowest correct responses regarding the benefit of iron and folic acid for pregnant women (39.3%) and the minimum meal frequency for non-breastfed children aged 6-23 months (27.8%). Overall, a significant difference in nutritional knowledge between study areas was observed ($p = 0.007$), with rural HCPs scoring lower than their urban HCP counterparts.

Regarding knowledge of childhood stunting, significant differences were observed among the items with the lowest percentages of correct answers by HCPs in both study areas: weight-for-age Z-score is not an indicator of stunting (33.8%), and stunting is not an acute nutritional disorder (42.2%). Overall, rural

Table 1: Characteristics of Healthcare Providers

Characteristics	Total	Region		p-value
		Rural	Urban	
	n (%)	n (%)	n (%)	
Region	557 (100)	213 (100)	344 (100)	p-value
Profession				< 0.001
Doctor	54 (9.7)	10 (4.7)	44 (12.8)[a]	
Nurse	172 (30.9)	88 (41.3)[a]	84 (24.4)	
Midwife	205 (36.8)	94 (44.1)[a]	111 (32.3)	
Nutritionist	55 (9.9)	8 (3.8)	47 (13.7)[a]	
Public Health Professional	34 (6.1)	5 (2.3)	29 (8.4)[a]	
Sanitarian	37 (6.6)	8 (3.8)	29 (8.4)[a]	
Gender				< 0.001
Male	84 (15.1)	46 (21.6)	38 (11)	
Female	473 (84.9)	167 (78.4)	306 (89)	
Education				< 0.001
Diploma Degree	404 (72.5)	179 (84)	225 (65.4)	
Bachelor and Master Degree	153 (27.5)	34 (16)	119 (34.6)	
Religion				< 0.001
Islam	423 (75.9)	121 (56.8)	302 (87.8)[a]	
Christiani	71 (12.7)	50 (23.5)[a]	21 (6.1)	
Chatolic	63 (11.3)	42 (19.7)[a]	21 (6.1)	
Ethnicity				< 0.001
Malay	274 (49.2)	79 (37.1)	195 (56.7)[a]	
Dayak	115 (20.6)	95 (44.6)[a]	20 (5.8)	
Java	102 (18.3)	23 (10.8)	79 (23)[a]	
Madura	10 (1.8)	0 (0)	10 (2.9)[a]	
Others	56 (10.1)	16 (7.5)	40 (11.6)	
Training related to maternal and child nutrition and health				0.002
Have Training	265 (47.6)	84 (39.4)	181 (52.6)	
No Training	292 (52.4)	129 (60.6)	163 (47.4)	

Notes: [a]Adjusted Residual (> 1.96), p-value determined by the Chi-Square Test. Other is excluded from the Chi-square test of Ethnicity.

HCPs demonstrated lower stunting knowledge than urban HCPs, with significant regional differences (p = 0.013) (Table **2**).

3.1.3. Perception of Social Norms and Cultural Values Impacting Stunting

The comparison of HCPs' perceptions of social norms and cultural values that impact stunting showed significant regional differences across study areas (p = 0.009), with rural HCPs showing higher agreement than urban HCPs (Table **3**).

3.1.4. Perspective on the Implementation of Stunting Prevention

Significant regional differences in HCPs' perspectives on the implementation of stunting

Table 2: Knowledge of Nutrition for Pregnant Women and Children under Two Years, and Knowledge of Childhood Stunting

Items	Total	Region		p-value
		Rural	Urban	
	n (%)	n (%)	n (%)	
Healthcare providers' knowledge of nutrition for pregnant women and children under two years				
Daily oral iron and folic acid supplementation are recommended for reducing the risk of pre-eclampsia in pregnant women.*	219 (39.3)	69 (32.4)	150 (43.6)	0.008
Breastfeeding mothers should avoid consuming chili because it can cause diarrhea in babies.*	406 (72.9)	132 (62)	274 (79.7)	< 0.001
Mothers should stop breastfeeding their under six months baby if they feel sick.*	503 (90.3)	183 (85.9)	320 (93)	0.006
If the infant and young children have diarrhea, breastfeeding, and meal provision is better delayed until diarrhea stops.*	510 (91.6)	182 (85.4)	328 (95.3)	< 0.001
Complementary foods can be introduced to the infant at any time if they have shown an interest in food.*	496 (89)	181 (85)	315 (91.6)	0.015
The minimum meal frequency for non-breastfed children aged 6-23 months is 3 times.*	155 (27.8)	52 (24.4)	103 (29.9)	0.157
Adding sugar and salt to complementary foods of children under one year is recommended to increase a child's appetite.*	397 (71.3)	141 (66.2)a	256 (74.4)	0.037
Low Knowledge of Nutrition (< 9)	133 (23.9)	64 (30)	69 (20.1)	0.007
High Knowledge of Nutrition (≥ 9)	424 (76.1)	149 (70)	275 (79.9)	
Healthcare providers' knowledge of childhood stunting				
Genetics is the only one factor that influences child growth.*	453 (81.3)	153 (71.8)	300 (87.2)	< 0.001
Childhood stunting is an acute nutritional disorder in children. *	235 (42.2)	64 (30)	171 (49.7)	< 0.001
The weight-for-age Z-score is an indicator of stunting measurement.*	188 (33.8)	54 (25.4)	134 (39)	< 0.001
A child with a Heigh for Age of Z score < -2 SD means having a normal nutritional status.*	333 (59.8)	107 (50.2)	226 (65.7)	< 0.001
Diarrhea, pneumonia, and tuberculosis in children can interfere with the child's growth.	543 (97.5)	209 (98.1)	334 (97.1)	0.451
Immunization is unnecessary because the child's natural immune system is adequate.	540 (96.9)	200 (93.9)	340 (98.8)	< 0.001
Low Knowledge of Stunting (< 7)	207 (37.2)	93 (43.7)	114 (33.1)	0.013
High Knowledge of Stunting (≥ 7)	350 (62.8)	120 (56.3)	230 (66.9)	

Notes: * Negative statement, the total percentage was the total correct answer, p-value determined by the Chi-Square Test. The cut-off points (COPs) for the nutrition knowledge table are 9, and for the stunting knowledge table are 7. Items displayed are the only ones selected for brevity.

prevention were identified (p = 0.013), with rural HCPs showing the lowest effectiveness (Table **4**).

3.1.5. Perspective on Barriers in Implementing Stunting Prevention

Figure **1** shows the comparison of HCPs' perspectives on barriers to implementing stunting prevention between rural and urban areas. A significant regional difference was observed (p < 0.001), with rural HCPs reporting higher barriers than urban HCPs.

3.2. Phase 2. Qualitative Findings

3.2.1. Characteristics of Participants

Eight HCPs in rural Puskesmas were interviewed to explore their challenges in implementing stunting prevention. There are two Puskesmas midwives, a sanitarian, a nutritionist, a public health professional, and three village midwives. All participants were female, aged 28 to 49 years, with 2 to 29 years of work experience at the Puskesmas. Their educational

Table 3: Healthcare Providers' Perception of Social Norms and Cultural Values that Impact Stunting

Items	Total	Region		p-value
		Rural	Urban	
	n (%)	n (%)	n (%)	
Mothers and families perceived stunting as a normal child's condition.	431 (77.4)	177 (83.1)	254 (73.8)	0.011
Mothers and families think that the child's height growth is not related to nutritional intake.	454 (81.5)	177 (83.1)	277 (80.5)	0.447
During pregnancy, some pregnant mothers still believe in and undergo restrictions on particular food like chicken, meat, eggs, fresh fish, etc.	434 (77.9)	182 (85.4)	252 (73.3)	< 0.001
There are postpartum mothers who do food restrictions or follow specific food diets.	429 (77)	183 (85.9)	246 (71.5)	< 0.001
There are mothers who do not exclusively breastfeed or offer complementary foods early before their baby is six months old.	471 (84.6)	183 (85.9)	288 (83.7)	0.486
Parents/in-laws have an important role in caring for and providing food for postpartum/breastfeeding mothers	523 (93.9)	207 (97.2)	316 (91.9)	0.011
There are mothers who limit certain types of food for children under two years, like meat, fresh fish, nuts, eggs, butter, etc.	387 (69.5)	158 (74.2)	229 (66.6)	0.058
There are mothers with children under 2 years who do not provide immunizations for their children.	489 (87.8)	182 (85.4)	307 (89.2)	0.183
Low Agreement (< 15)	186 (33.4)	57 (26.8)	129 (37.5)	0.009
High Agreement (≥ 15)	371 (66.6)	156 (73.2)	215 (62.5)	

Notes: The total percentage was the total agreement score; the p-value was determined by the Chi-Square Test. The cut-off point (COP) for this table is 15.

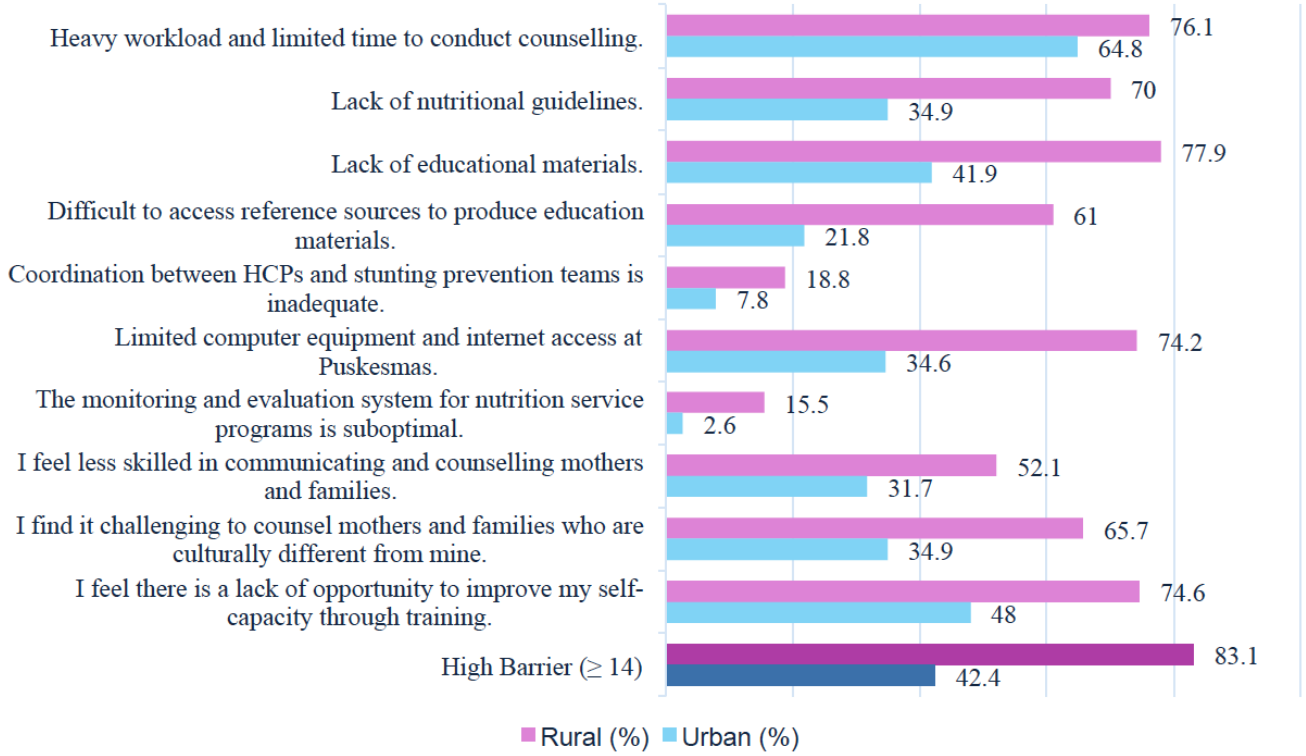

Figure 1: Healthcare Provider Barriers: Rural vs Urban.

Notes: The cut-off point (COP) for this figure is 14.

Table 4: Perspective on the Implementation of Stunting Prevention

Items	Total	Region		p-value
		Rural	Urban	
	n (%)	n (%)	n (%)	
Health promotion and information about stunting and its prevention are conveyed to all sections of society.	206 (37)	59 (27.7)	147 (42.7)	< 0.001
Every pregnant woman who visited antenatal care was provided information on maintaining pregnancy health and nutrition.	375 (67.3)	124 (58.2)	251 (73)	< 0.001
Providing health and nutrition education for pregnant women involves family members.	195 (35)	60 (28.2)	135 (39.2)	0.008
Counselling is given to every pregnant woman with health and nutrition issues in the antenatal care unit.	318 (57.1)	110 (51.6)	208 (60.5)	0.041
Families who believe in restricting certain foods for pregnant and lactating women and children under two years obtained an ongoing approach and education.	149 (26.8)	58 (27.2)	91 (26.5)	0.841
Mothers with children under two years old are trained in making complementary feeding with diet diversity and age-appropriateness.	116 (20.8)	44 (20.7)	72 (20.9)	0.939
Families with stunted children are provided counselling on recommended child feeding practices through home visits.	201 (36.1)	62 (29.1)	139 (40.4)	0.007
Growth monitoring at Posyandu is routinely implemented in each village through providing supplementation and immunization.	322 (57.8)	120 (56.3)	202 (58.7)	0.580
Less Effective (< 20)	225 (40.4)	100 (46.9)	125 (36.3)	0.013
Effective (≥ 20)	332 (59.6)	113 (53.1)	219 (63.7)	

Notes: p-value determined by the Chi-Square Test. The cut-off point (COP) for this table is 20. Items displayed are the only ones selected for brevity.

backgrounds ranged from a diploma to a master's degree, and they have Malay and Dayak cultural backgrounds.

3.2.2. Categories and Sub-Categories

Qualitative analysis identified three main categories that illustrate the key challenges faced by rural HCPs in implementing stunting prevention (Table **5**).

4. DISCUSSION

This study reveals significant gaps in understanding and performance related to stunting prevention implementation between rural and urban primary HCPs in Indonesia. Rural primary HCPs reported less knowledge of nutrition and stunting than their urban counterparts. Both quantitative and qualitative data showed that the primary factors contributing to these differences were unequal distribution and persistent shortages of HCPs, lower levels of education, and fewer opportunities for training. These results align with prior studies conducted in other low- and middle-income countries (LMICs), including Ethiopia, Egypt, and Ghana, which revealed that rural healthcare facilities frequently experience staff shortages and a lack of opportunities for their primary HCPs to continue further education and access training, thus limiting care quality and making stunting prevention efforts ineffective [6, 24, 25].

The integration of quantitative and qualitative findings further underscores that a lack of awareness among rural HCPs directly contributes to the ineffectiveness of stunting prevention efforts, particularly regarding preventive measures such as emphasizing the importance of nutritional intake during pregnancy, assessing and screening children's nutritional status, and providing education and counseling for mothers and families. Furthermore, poor coordination among HCPs and unclear guidelines significantly diminish the effectiveness of stunting prevention implementation [26, 27]. To address stunting, HCPs must possess adequate nutritional competencies [28], particularly in conducting early identification and nutritional assessments. Previous research has demonstrated that effective early assessment and nutritional screening can prevent malnutrition, support timely interventions, improve professional practice, and enhance the effectiveness and efficiency of health services [29]. Furthermore,

Table 5: The Challenges Faced by Rural Primary Healthcare Providers (HCPs) in Implementing Stunting Prevention

Categories	Sub-categories and Quotation
Weak of awareness	Stunting prevention during pregnancy less emphasizes the importance of nutritional intake *"For pregnant women, prevention efforts focus on regular iron supplement consumption."* (P6)
	Lack of active role on child growth assessment and screening *"We ask the mother, 'Does your child have any eating complaints? How much does he eat and drink milk daily?'"* (P2)
	Lack of decision making to provide support (nutritional consultation) for pregnant women and mothers with children under 2 years *"We usually only focus on handling diseases... If we find nutritional problems, we refer them to a nutritionist."* (P2)
	Lack of effective and systematic strategy in delivering education support *"We only use the MCH handbooks for health education, and the topics are mostly the same each time."* (P6)
	Gaps on coordination and cooperation in the team of stunting prevention implementation. *"What is needed is active coordination among all departments to address stunting. Currently, collaboration among the five key departments is not going well yet."* (P7)
	Unclear guideline and system on stunting prevention and management *"What disappoints me and the team is that there is no follow-up for the diagnosed stunted children. I think what seems to be out of sync may stem from the central government's changing definition of stunting areas."* (P7)
Issues with HCPs' capacity	HCP overburden due to insufficient the number of HCP *"Working alone in Posyandu is tough, as I have to counsel and provide services... As the only village midwife, I often feel overwhelmed."* (P5)
	Inadequate training support about knowledge and communication skill on stunting prevention for HCP *"Until now, I have not received any training opportunities. I need to enhance my communication skills, because when educating mothers, I feel quite incapable." (P6)*
	Knowledge gaps about stunting that different among HCPs *"Stunting is... poor nutrition. Then, being dwarf, right? And also, malnutrition."* (P4)
	Limited engagement to the community *"People need approaches from HCPs, but HCPs often struggle to engage with them due to busyness, time constraints, and the wide scope of their work-areas."* (P7)
	Overpowering communication and attitude from HCP to the mothers *"We scold the mother who rarely visits Posyandu, saying 'If you're not diligent in attending, it could harm your child (in an angry tone).' This warning made her attend more regularly."* (P8)
Socio-cultural Challenge	Struggling in addressing cultural issue *"...we have tried to recommend eating protein-rich foods, but the local customs remain a strong influence, making it difficult to change their behaviour."* (P5)
	Struggling in addressing stigma surrounding stunting *"Some people are still worried or even afraid to hear about stunting; they fear that their children will be diagnosed, as it is seen as a disgrace."* (P1)
	Struggling in increasing mothers' awareness of health behavior *"Let alone attending toddler classes, some mothers do not even want to come to the Posyandu. They still do not understand its importance." (P1)*

evidence suggests that well-designed nutrition guidelines and protocols are needed to improve health decision-making processes, the quality of health services, and health outcomes [27, 30].

In addition to the lack of knowledge and awareness among rural HCPs, socio-cultural factors pose a significant impediment to the effectiveness of stunting prevention. Indonesia, as an archipelagic country with diverse ethnic groups, experiences public health behaviours that are often influenced by socio-cultural values. Rural HCPs recognize the socio-cultural impact on stunting; however, they frequently find it challenging to address these issues. The varied cultural backgrounds of mothers, the persistent societal stigma surrounding child stunting, and limited maternal awareness are significant factors contributing to these challenges. Limited socio-cultural competence among rural HCPs often creates a communication gap that hinders the effectiveness of health education, efforts to promote health-seeking behavior, and the utilization of health services by mothers and families [31, 32]. To interact effectively with mothers and raise their awareness of health behaviors, rural HCPs need adequate cultural competence [33]. Furthermore, rural HCPs must also possess advocacy-oriented behaviors

to address the social stigma surrounding stunted children in the community, making it easier to collaborate with parents to build the view that stunting is a preventable condition and not simply a parental failure [34]. Rural HCPs in this study reported encountering structural barriers to their capacity, including heavy workloads, inadequate community engagement, and overly authoritative communication styles toward mothers. These barriers may have further eroded community trust and acceptance of prevention efforts, making it more challenging for rural HCPs to address cases of stunting. Improving community engagement and developing culturally sensitive, respectful communication skills are essential for rural HCPs to build trust, reduce maternal and family resistance to preventive care, and enhance counseling effectiveness [35]. These findings are consistent with evidence from other LMICs, such as Bangladesh and India. A study in rural Bangladesh showed similar results, in which the influence of social norms and traditions on mothers and children inhibited their efforts to promote nutrition and provide accurate nutrition education [36]. Evidence from rural India, meanwhile, indicates that challenges related to societal stigma, trust issues between caregivers and care-seekers, inadequate communication, and the overburdening of frontline workers hinder service effectiveness and contribute to the perpetuation of child malnutrition [37]. These similarities illustrate the prevalent sociocultural challenges in stunting prevention that are widespread among LMICs. However, the effectiveness of stunting prevention must be tailored to each country's specific sociocultural and structural context.

Based on this research, the interconnected challenges point to the urgent need for comprehensive system support and capacity-building strategies for rural HCPs in Indonesia [38]. To address the limited number of HCPs, rural health policy must prioritize not only the recruitment and retention of priority primary HCPs but also strengthening the capacity and competency of most existing HCPs (such as nurses and midwives) through sustainable, locally context-based training programs to increase health service coverage [39]. Furthermore, establishing standardized stunting prevention guidelines that emphasize structured early nutrition screening, targeted counseling strategies, and integration with existing maternal and child health services is crucial to support more targeted stunting prevention implementation in areas still struggling with stunting. Additionally, there is an urgent need to develop professional training curricula that not only improve nutrition knowledge but also build cultural competency, advocacy skills, and respectful/ empathetic communication, complemented by field-based practice tailored to local community needs.

Overall, these findings provide a strong information base for educational institutions and policymakers, not only in Indonesia but also in other countries. These findings can be used by educational institutions to design training curricula and by policymakers to formulate more adaptive healthcare policies to address stunting in rural areas.

5. LIMITATIONS AND STRENGTHS

Researchers recognized the potential for response bias in the self-administered questionnaires used in this study, suggesting that responses may not fully reflect the actual situation. The study findings may not apply across all contexts, especially outside rural primary healthcare settings. Especially in our qualitative study, doctors and nurses were not included as participants. Therefore, future research should involve them to better understand their roles in implementing stunting prevention, which is essential for developing effective strategies for all primary HCPs in rural areas.

Despite the limitations, to the best of the researchers' knowledge, this is the first Indonesian study to compare knowledge, performance, and challenges in the implementation of stunting prevention between primary HCPs in a rural area with the highest stunting rate and an urban area with the lowest rate, using integrated quantitative and qualitative methods. This integrated research approach contributed to improving the credibility of the findings.

This study recommends developing intervention programs and effective policies to enhance rural primary HCPs' capacity to prevent stunting. Additionally, this study has implications for global understanding, indicating that capacity gaps among rural HCPs could significantly impede stunting reduction efforts at national, regional, and global levels, thereby contributing to ongoing challenges in global child health equity. Thus, these findings further offer valuable insights for other countries facing similar challenges in combating stunting in rural primary healthcare settings.

6. CONCLUSION

Our study shows substantial competency gaps among rural HCPs in stunting prevention. Policymakers, including local governments and health

authorities, need to develop training programs for HCPs that emphasize nutrition, cultural competency, advocacy, and communication skills. They must also create effective policies and formulate standardized, easy-to-implement guidelines in stunting prevention tailored to rural primary care settings. This measure could strengthen healthcare services and support attempts to reduce stunting in rural areas.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Research Ethics Committee of ITEKES Muhammadiyah West Kalimantan, with approval number 385/II.I.AU/KET.ETIK/XII/2022. Informed consent was obtained from all respondents prior to the study.

CONFLICT OF INTEREST

The authors declare no potential conflicts of interest.

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USE OF ARTIFICIAL INTELLIGENCE

The authors declare that no artificial intelligence tools were used in the preparation of this manuscript.

AUTHORS' CONTRIBUTIONS

RR, LL, RS, and AT were responsible for the conceptualization and design of this study. The data collection was conducted by RR. The data analysis and interpretation were carried out by RR, LL, RS, and AT. RR, LL, RS, and AT drafted the initial manuscript. All authors critically reviewed, revised the manuscript, and approved the final version for publication. All authors take responsibility for the integrity and accuracy of the data and the analysis. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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