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Understanding Cadre Coping Mechanisms in Utilizing Digital Tools for Stunting Intervention Programs

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Abstract

Digital tools have been increasingly adopted in health services in recent years. Cadres are now expected to integrate various digital platforms into their routine practices to enhance the effectiveness, accuracy, and reach of stunting prevention. However, their capacity remains limited due to restricted access to technology and growing workloads. This qualitative study explores the coping mechanisms employed by cadres in utilizing digital tools. Fifteen cadres from active Posyandu in three sub-districts of Sumedang were interviewed between December 2023 and January 2024. The sampling technique used was snowball sampling. Data were analyzed using NVivo software. The primary themes are workload management through task delegation, reliance on peer and family support to overcome digital literacy barriers, and the formation of informal learning networks for knowledge exchange. Despite highlighting cadre resilience and adaptability, these mechanisms also reveal challenges such as increased workload, inconsistent knowledge transfer, and unequal access to training and resources. The study highlights the urgent need for structured digital literacy training, accessible technical support, and equitable capacity-building to ensure effective and sustainable use of digital tools in stunting prevention. These insights offer valuable guidance for policymakers seeking to improve the quality and impact of community-level digital health interventions.

Introduction

Stunting remains a persistent public health concern, particularly in low-and middle-income countries, where it contributes to increased morbidity, impaired cognitive development, and reduced economic. The 2023 Indonesian Health Survey reported a national stunting prevalence of 21.5% (Ministry of Health Republic Indonesia, 2023). Although there was a slight decrease of 0.1% compared to the previous survey, this figure remains significantly above the desired reduction target (Ministry of Health Republic Indonesia, 2022). The government aims to reduce the stunting prevalence to 14% by the end of 2024 (The World Bank, 2021).

In response, many countries have prioritized stunting reduction through community-based intervention programs, with community health workers (CHWs) or cadres playing a central role in service delivery, health promotion, and data collection (Erku et al., 2023). Cadres, typically volunteer community members, play a vital role in these programs, serving as a crucial link between healthcare systems and communities. Their responsibilities often include growth monitoring, health promotion, and facilitating

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access to essential health services (The World Bank, 2021; Mutunga, Walker, & Bait, 2023). In recent years, digital tools, such as mobile health applications and electronic health records, have been increasingly integrated into stunting intervention programs to enhance the efficiency and effectiveness of cadre activities. These technologies offer the potential to improve data collection, provide real-time insights into child nutritional status, and support timely interventions (Erku et al., 2023; Dewi, 2024).

Digital platforms such as the Electronic Community-Based Nutrition Recording System (e-PPGBM), *Elektronik Sistem Pencegahan Stunting* (e-SIMPATI), and Electronic Human Development Worker (e-EHDW) have been introduced to support data-driven decision-making and improve program accountability (Pulse Lab Jakarta & UNICEF, 2023). However, the integration of such technologies has introduced new layers of complexity into the work of cadres. Factors such as varying levels of digital literacy, access to technology, technical difficulties, and increased workload can influence how cadres engage with and utilize these platforms (Susilawati, Fazriyani, Novrinda, & Nurrika, 2023). Recent studies have highlighted the importance of understanding the lived experiences and coping mechanisms of CHWs as they adapt to new digital tools, particularly in resource-constrained settings (Feroz, Jabeen, & Saleem, 2020).

This qualitative study aims to explore the coping mechanisms employed by cadres in utilizing digital tools within stunting intervention programs. This research seeks to generate evidence-based insights relevant to policymakers, program implementers, and digital health developers by examining cadres lived experiences, the challenges they face, and the strategies they employ to manage these challenges. These insights are crucial for developing strategies that ensure the effective and efficient use of digital tools in stunting intervention programs, contributing to improved child nutritional outcomes.

Method

The study used a qualitative research method. In-depth interviews were conducted for cadres who are responsible for Posyandu and stunting management. The interview process used a semi-structured questionnaire which consisted of a mix of open-ended and closed-ended questions (Kielman, Cataldo, & Seeley, 2011). The data collection period for this study started in December 2023 and ended in January 2024. The study was conducted in Sumedang District, which had the highest prevalence of stunting in West Java in 2022 (27.6%). This area was included in the pilot project intervention for the 100 highest stunting districts in Indonesia (District of Health Sumedang, 2023). Sub-districts were purposively selected based on the significant reduction in stunting prevalence by involving Posyandu cadres. The initial informant was chosen according to the variation needed by the nutritionist. The next informant was selected through snowball sampling by asking the prior informant to identify individuals or groups with a special understanding of a phenomenon. The researcher asked each participant to suggest others with a similar ability to address the issues. Each informant's interview session lasted approximately 30 – 60 minutes. This study went through an ethical review process and received ethical approval from the Health Research Ethics Committee, Faculty of Medicine, Universitas Indonesia, with reference number KET-1662/UN2.F1/ETIK/PPM.00.03/2023.

Data analysis was arranged simultaneously during collection or in the field by initiating reading and coding. A summary matrix was created for IDI to analyze whether additional information should be explored directly. All gathered information from voice recordings and field notes was transcribed verbatim and imported into Microsoft Word for content analysis. The researchers read the data carefully to gain a comprehensive understanding (Sutton & Austin, 2015). After the researchers was familiarized with the data, the researchers strived to identify small meaning units called the 'codes'. The codes were then grouped based on their shared concepts to form the primary categories. Based on the relationship between the primary categories, they were then clustered into secondary categories. The next step involved the identification of themes and expounding to make meaning out of the data.

Coding procedures were conducted using the copy/paste function in Microsoft Word and a mind map software application to visualize recurring patterns. A third reviewer addressed any inconsistencies found during the coding and theme analysis process.

Result and Discussion

The objective of this research is to explore the coping mechanisms employed by cadres in utilizing digital tools for stunting intervention programs. The coping mechanisms identified in this study highlight the resourcefulness and adaptability of cadres in integrating digital tools into their demanding roles within stunting intervention programs. Table 1 presents three main themes that emerged from the qualitative analysis of interviews with 15 cadres from different districts in Sumedang.

The obligation to use diverse digital tools has burdened cadres with additional responsibilities, especially when compounded by limited staffing and minimal training support, as shown in Figure 1. Consequently, cadres have developed a set of adaptive strategies, including task delegation, drawing upon technically proficient peers, and engaging in knowledge-sharing practices through digital communication platforms and informal peer groups. These strategies reflect an emergent model of adaptive learning and collaboration in response to digital demands (Gadsden et al., 2022).

The integration of digital platforms into stunting intervention programs has significantly transformed the roles and responsibilities of community health cadres, particularly in relation to data management. Cadres are now expected to operate various digital applications such as e-PPGBM, e-SIMPATI, and e-EHDW, which were previously managed by Puskesmas staff. This shift has resulted in cadres assuming direct responsibility for entering and submitting anthropometric data (e.g., weight

TABLE 1. Coping Mechanism

Coping Mechanism	Description	Benefits	Challenges
Workload Management	Delegation of digital tasks among cadres	Reduces burden, minimizes errors	Fragmented responsibilities
Peer and Family Support	Assistance from colleagues and family	Bridges digital literacy gaps	Inconsistent training, privacy risks
Adaptive Learning Networks	Internal knowledge sharing and collaborative supportt	Promotes continuous learning and resilience	Potential for misinformation

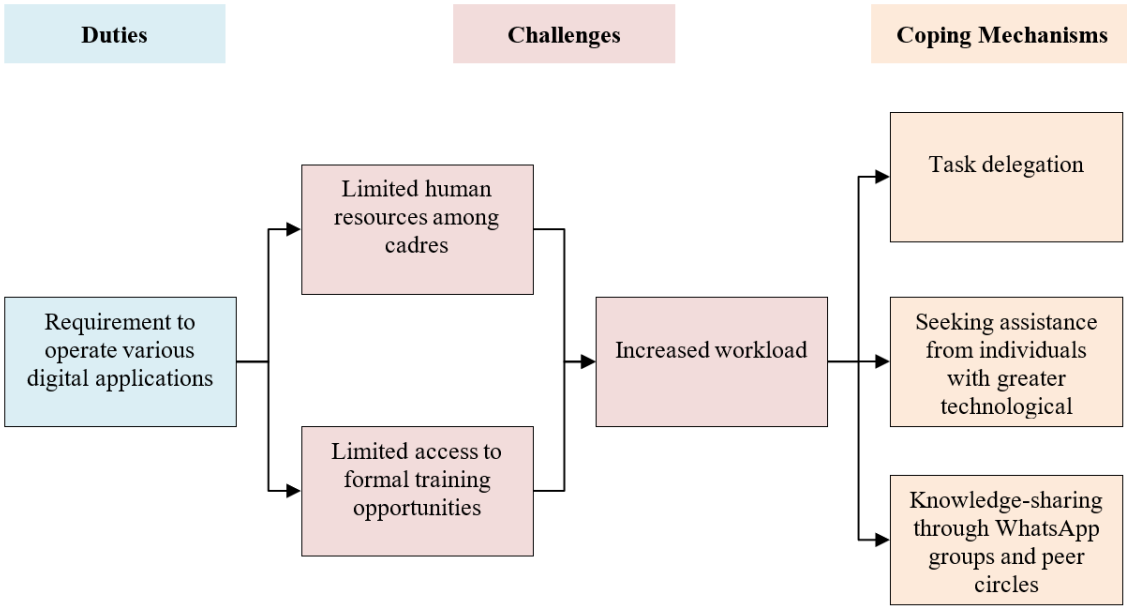

Figure 1. Cadres Digital Tool Challenges and Adaptive Strategies

and height) into electronic systems, which are essential for monitoring nutritional indicators and facilitating early detection of stunting cases (Duffy et al., 2025). Although digitalization holds promise for enhancing the efficiency of health interventions and improving data accuracy, it simultaneously introduces new operational challenges. The transfer of data management responsibilities to community health cadres has been associated with increased workload and heightened perceptions of stress and overwhelm (Do Nasci,ento et al., 2023). It is frequently implemented without sufficient training or continuous technical support. Time constraints further exacerbate these challenges, as cadres should update data promptly and respond to application notifications within limited timeframes. Moreover, this situation is compounded by the expectation that cadres continue to fulfill their traditional health-related duties, manage household responsibilities, and meet community expectations (Braun, Catalani, Wimbush, & Israelski, 2013).

The literature emphasizes that while task shifting can improve service delivery, it may also contribute to work overload and job dissatisfaction among community health workers (Zaman et al., 2024). In response, cadres have adopted a range of coping strategies, including internal task delegation, where different team members specialize in specific digital applications. This division of labor has shown potential benefits, like reducing individual workload and fostering collaboration and teamwork (Moradi, Rezaei, & Alavi, 2024). This approach underscores the fragmented and demanding nature of digital data reporting in current practice. One cadre shared their experience, stating:

> "If a cadre is responsible for data entry alone, it can be overwhelming, especially since the weighing data must be entered into the system within 24 hours. Therefore, after the Posyandu activities, two cadres focus specifically on that role to help reduce the burden and minimize human error."

Task management strategies also involve modeling effective practices to encourage shared responsibility and improve team performance. These findings align with broader research emphasizing the need for digital health interventions to be accompanied by adequate support systems. Moreover, comprehensive training, well-defined task allocation, and ongoing supervision are critical strategies for promoting long-term sustainability and mitigating burnout among frontline health workers (Keppet et al., 2025; Sing et al., 2025). Without such support mechanisms, the intended benefits of digitalization may be compromised by increased stress and decreased effectiveness at the community level.

The increasing digitization of health services in stunting intervention programs has brought significant operational challenges for community health cadres, particularly those with limited digital literacy. This study found that one of the most prominent coping strategies used by cadres is reliance on peer support and assistance from family members. Cadres frequently turned to more technologically proficient colleagues within their Posyandu or neighboring communities for support in understanding and operating digital applications. These informal interactions often involved practical demonstrations, shared troubleshooting, and collaborative efforts to navigate specific features of the systems. In many cases, the learning process occurred initially during or after Posyandu activities, emphasizing the importance of peer-based learning environments in contexts where formal technical training is lacking. The limited digital skills of many cadres often led to decreased self-efficacy. However, peer collaboration helped mitigate these feelings by fostering a shared sense of responsibility and collective learning (Friska et al., 2022; Handayani et al., 2018). The importance of a supportive environment in enhancing user intention to adopt and engage with digital systems is also supported by previous findings (Sidiq, 2017).

In addition to peer learning, the study identified that family members, especially younger relatives, were frequently cited as a practical solution to digital barriers. Cadres described how their children, who are generally more familiar with smartphones and digital applications, provided guidance and training at

home. Support from family members has been identified as a vital element in strengthening cadres' ability to fulfill their responsibilities successfully (Ratnasari, Marni, & Husna, 2019). As one cadre articulated:

> "Nowadays, all toddler data reporting is fully digital. So whether they like it or not, cadres must be able to operate at least a mobile phone. When at the Posyandu, we can ask the midwife or other colleagues, but when at home, I try to get my child to teach me."

The reliance on social support networks reflects a broader trend in global health interventions, where community-based learning and collaboration are critical to program success (Haldane et al., 2019). Although these informal support networks effectively address immediate digital literacy needs, their reliance on non-standardized training and formal protocols may lead to unintended consequences. Specifically, the absence of formal protocols can result in inconsistencies in data entry practices and increase the potential for data privacy breaches (Mumtaz et al., 2023). Furthermore, not all cadres have equal access to digitally literate colleagues or family members, raising concerns about the sustainability and equity of such informal approaches.

To optimize the effective and secure utilization of digital tools, it is critical for health authorities to establish comprehensive training programs and accessible support systems that address the heterogeneous needs of community health cadres. Adequate training enhances the efficiency and quality of service delivery by community health workers. Competence refers to the capacity to effectively execute specific tasks by applying relevant knowledge and skills to achieve intended outcomes (Eryando & Afrizal, 2024). However, the sustainability of informal coping mechanisms remains uncertain, given the unequal access among cadres to knowledgeable peers or technologically proficient family members. These findings are consistent with existing literature that highlights the necessity of structured, continuous digital literacy training and formal technical support frameworks to strengthen the capacity and sustainability of community health workforce interventions (Miranda et al., 2023).

The findings of this study highlight the emergence of adaptive learning networks among Posyandu cadres as a coping mechanism in the context of digital transformation and limited formal training opportunities. Most informants reported limited awareness or direct access to basic competencies on the stunting digital platform. Instead, a representative system is often employed, where only selected cadres attend formal training sessions due to constraints such as limited resources, time, or availability. This approach necessitates the development of informal knowledge-sharing mechanisms to ensure that essential information is disseminated throughout the cadre network (Raflizar, Damris, Johari, & Herlambang, 2025).

Informal learning networks, such as WhatsApp groups and peer circles, have become vital platforms for cadres to share tips, troubleshoot issues, and disseminate digital training materials. Digital tools, such as mobile apps, can complement traditional methods to expand reach and cost efficiency (Bégin, Berthod, Martinez, & Truchon, 2022). Cadres described how training content is often relayed indirectly through group chats or directly explained during routine meetings and Posyandu events. As one cadre noted:

> "The digital training material will be shared at the Posyandu before opening day or the monthly routine meeting in the subdistrict office. If there are still cadres who do not understand, they are asked to consult the Puskesmas team."

This peer-driven approach to knowledge transfer is consistent with the principles of community-based participatory research, which emphasize the importance of community involvement and mutual learning in health interventions (Haldane et al., 2019). However, participants also acknowledged several limitations of these adaptive learning networks. There is no guarantee that all cadres will read, understand, or retain the training materials

shared through informal channels. The risk of information loss or misinterpretation is heightened in the absence of structured follow-up or refresher sessions. Some cadres expressed a desire for more regular and inclusive training opportunities to ensure that all members are equally equipped to utilize digital tools effectively. The literature supports the value of adaptive learning networks in resource-limited settings, where formal training infrastructure may be insufficient. These networks foster resilience, collective problem-solving, and continuous learning among community health workers (Glenton et al., 2013). Nevertheless, to maximize their effectiveness, it is essential to complement informal learning with structured, ongoing training and accessible technical support. The improvement in cadre skills was driven by training methods like lectures, discussions, and applied practice (Lubis & Syahri, 2015). The approach can help bridge knowledge gaps, standardize practices, and enhance the overall capacity of cadres to implement digital health interventions (Miranda et al., 2023).

Conclusion

Cadres employ a range of adaptive coping mechanisms to navigate the challenges of digitalization in stunting intervention programs. They are navigating increased responsibilities and technological demands by creating a variety of coping strategies, including task delegation, seeking support from peers and family members, and leveraging informal learning networks. These adaptive responses underscore the resilience and ingenuity of cadres in overcoming barriers related to digital literacy, workload, and limited access to formal training. However, the reliance on informal mechanisms also exposes gaps in the current support systems, such as inconsistencies in knowledge transfer, potential data management issues, and unequal access to resources. To ensure the effectiveness and sustainability of digital health interventions, it is essential to provide structured digital literacy training, accessible technical support, and equitable opportunities for all cadres. Strengthening these areas will not only enhance cadres' capacity to utilize digital tools but also improve the overall quality and impact of stunting intervention programs at the community level.

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