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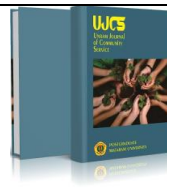

Implementing a Dual Screening Protocol for Diabetes and Frailty in a Community-Dwelling Older Adults

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Abstract: Frailty, a significant geriatric syndrome, is a major complication of diabetes and is associated with adverse health outcomes. Indonesia, with its rapidly aging population, faces a substantial burden from these conditions. Community-based screening is essential for early detection and intervention. A community engagement program was conducted in Gunung Anyar District, Surabaya, involving 189 elderly participants. Simultaneous screenings for diabetes (via random blood glucose test) and frailty (using the validated FRAIL questionnaire) were performed. The study revealed a high dual burden of disease: 42.0% of participants had blood glucose levels indicative of diabetes, while 11.6% were classified as frail and 39.7% as pre-frail. About 30% of them were both unfit and poor glycemic control. This program demonstrates a high prevalence of diabetes and frailty among community-dwelling older adults in Surabaya, underscoring the urgent need for integrated geriatric care. The successful implementation of dual screening highlights the feasibility of incorporating these measures into primary care and the critical role of training community health workers to enable sustainable, early detection and management strategies.

Keywords: Diabetes, Frailty, Elderly, Community.

Introduction

Frailty has emerged as a significant global health challenge. Since its initial conceptualization by Fried over two decades ago, it has been extensively researched and consistently associated with numerous adverse health outcomes, including disability, cognitive decline, falls, hospitalization, and mortality. (D. M. Elmaleh & Mohamed, 2025; Mei et al., 2021; Vermeiren et al., 2016) It is also recognized as the third most major complication of diabetes, following macrovascular and microvascular events. (Bu et al., 2023) Reflecting its clinical importance, formally identified frailty—along with sarcopenia—as a geriatric syndrome in 2016, highlighting its substantial contribution to morbidity in older adults.(Badrkhahan et al., 2023)

The scale of the issue is particularly evident in Indonesia. A multicenter study by (Setiati et al., 2019) revealed that 25.2% of older adults were frail and 61.6% were pre-frail, while only 13.2% were classified as robust. These figures underscore a considerable public health burden, which is further amplified by Indonesia's demographic context. As the world's fourth most populous country, Indonesia has now transitioned into an aging society, with over 8% of its population being elderly. (United Nations, 2019) The high prevalence of both frailty and diabetes threatens to strain the nation's healthcare system, making early screening and primary prevention essential for timely intervention in diabetic patients, particularly those with or at risk of frailty.

In response, local and academic institutions have initiated proactive community-based programs. For instance, Gunung Anyar District in Surabaya has established measures such as Posyandu Keluarga (family health posts), trained elderly health cadres, and free screening programs to combat non-communicable diseases including diabetes. Aligned with these efforts, the Faculty of Medicine at Universitas Pembangunan

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Nasional "Veteran" Jawa Timur launched a community engagement program focused on diabetes screening and education for elderly residents. These initiatives represent critical steps toward integrating clinical care with sustainable public health strategies for an aging population.

Method

PKM EDU is a community development initiative implemented in the Gunung Anyar District of Surabaya. The activities were conducted under an official permit from the Faculty of Medicine at Universitas Pembangunan Nasional "Veteran" Jawa Timur, issued to the Head of Gunung Anyar District. The program was executed in several stages:

1. Preliminary Surveys and Coordination
   Initial surveys and coordination meetings were held with the local community health center (Puskesmas) and its elderly health cadres. During these sessions, we introduced the program's concept and highlighted the critical importance of early detection for both diabetes and frailty in the elderly population. This initiative was strategically timed to align with National Elderly Day. Our surveys revealed that many cadres and Puskesmas staff were unfamiliar with the concept of frailty and its associated screening tools. In response, we introduced a simplified yet validated frailty screening tool designed for effective use by community members and cadres.
2. Early Detection of Diabetes Mellitus and Frailty
   Diabetes screening was performed via random blood glucose testing. Frailty was assessed using the FRAIL questionnaire, a tool validated for the Indonesian population and deemed appropriate for community-dwelling older adults (Sukkriang & Punsawad, 2020)

Result and Discussion

The program was held on June 22nd 2025 at District office of Gunung Anyar. A total of 189 participants attended the program. (Figure 1, Figure 2, Figure 3) The median age of the participants was 65 (60-88) and most of the participants were female (70,9%). (Table 1)

Figure 1. Blood Glucose Checking

Figure 2. Medical Examination

Figure 3. Frailty screening

Table 1. Characteristics of the Subjects

Characteristics	n, %
Gender	55 (29,1)
Male	134 (70,9)
Female	
Age (Median, min-max)	65 (60-88)
Marital Status	
Married	152 (80,4)
Divorce	16 (8,5)
Divorced by death	21 (11,1)
Education	
Elementary school	34 (18)
Junior high school	48 (25,4)
Senior high school	80 (42,3)
Undergradute above	27 (14,3)
Random blood glucose (Median, min-max), mg/dL	138 (81-565)
Hypertension	
Yes	88 (46.5)
No	100 (52.9)
Using Diabetes Medication	
Yes	50 (26,5)
No	139 (97,2)

We screened diabetes using random blood glucose and found 42% were diagnosed with diabetes mellitus based on this result. (Figure 4) Moreover, from FRAIL questionnaire we found 39,7% and 11,6% subjects were categorized as pre frail and frail, respectively. (Figure 5) Furthermore, only 21.1% of participants were robust and had well-controlled glycemic status, while the vast majority were either frail, pre-frail, or had poor glycemic control.

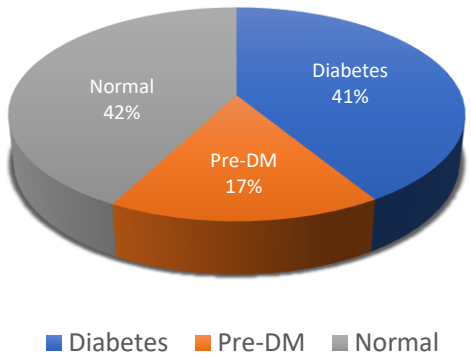

Figure 4. Percentage of Diabetes Status Among Participants

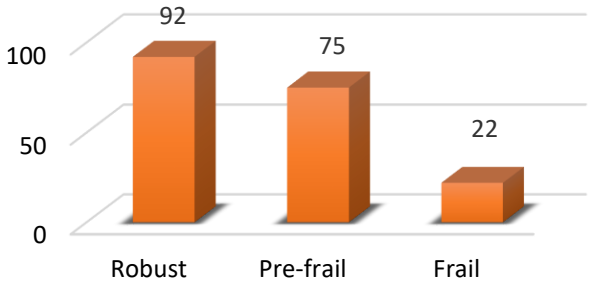

Figure 5. Percentage of Frailty Status Among Participants

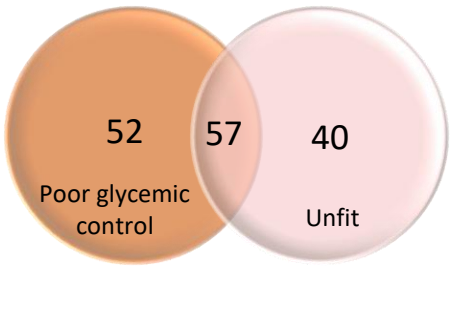

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Figure 6. The Overlap Frailty Status and Poor Glycemic Control

This community engagement program successfully conducted simultaneous screenings for diabetes and frailty among 189 older adults in Gunung Anyar District, Surabaya. Participants, whose ages ranged from 60 to 88 years with a median of 65, represented a broad spectrum of the community's elderly population, from the "young-old" to the "old-old."

The key findings reveal a high prevalence of both conditions: 42.0% of participants had random blood glucose levels indicative of diabetes mellitus, while 11.6% were classified as frail and 39.7% as pre-frail. Moreover, more than 30% individuals have both unfit (frail or prefrail status) and poor glycemic control. These results underscore a significant dual disease burden in this community and highlight the critical intersection between diabetes and frailty in Indonesia's aging population.

The diabetes prevalence in our cohort (42.0%) is substantially higher than the national estimate of 10.8% for Indonesia's general population. (Kementerian Kesehatan, 2018) This disparity is likely multifactorial. First, the study specifically targeted an elderly demographic, a group at higher risk for type 2 diabetes due to age-related physiological changes. Second, the voluntary, community-based nature of the screening

may have attracted individuals with existing health concerns, introducing a potential selection bias. This finding aligns with a similar screening program in Kendari by (Zi et al., 2025) , which reported a diabetes prevalence of 47.6%. Nevertheless, this high figure serves as a stark indicator of the considerable diabetes burden within this community.

Similarly, the combined prevalence of frailty and pre-frailty (51.3%) is a significant concern, indicating that over half of the screened individuals were affected. While the frailty rate (11.6%) is lower than the 25.2% reported in a multicenter hospital-based study by (Setiati et al., 2019), the difference is likely due to setting. Our community-based sample likely included individuals with fewer comorbidities than a hospital cohort. The discrepancy could also be attributed to the different screening tools used; we employed the concise FRAIL questionnaire, while (Setiati et al., 2019) used the comprehensive 40-item Frailty Index (FI-40), which assesses physical, psychological, and social domains. A meta-analysis by (Pradana et al., 2023) found a pooled frailty prevalence of 26.8% (95% CI: 20%–34.8%) in Indonesian elderly across various settings, underscoring that rates can vary based on methodology and population. Meanwhile, the prefrailty prevalence was 55.5% in the Indonesian older adults (95% CI: 50.3%–60.6%).

The use of the FRAIL questionnaire was highly appropriate for this community setting. Its value lies in efficiently identifying at-risk individuals for further assessment. (Gleason et al., 2017) It is widely used, has been validated in Indonesian, and its implementation here demonstrates a viable option for integrating frailty screening into standard Puskesmas programs for the elderly.

The co-occurrence of high diabetes and frailty prevalence as shown in present study is particularly alarming given their well-established bidirectional relationship. Diabetes accelerates frailty through pathways like sarcopenia, chronic inflammation, and oxidative stress. Conversely, frailty complicates diabetes management by reducing physical activity and functional capacity. Frailty is increasingly recognized as a common complication of diabetes (Bu et al., 2023) and persistent hyperglycemia has detrimental effects on skeletal muscle that increase frailty risk. (Wu et al., 2022) Our findings suggest that a substantial number of older adults in Gunung Anyar are caught in this cycle, necessitating integrated care strategies.

A pivotal insight from this program was the initial lack of familiarity among local health cadres and Puskesmas staff with frailty and its screening. This knowledge gap is a major barrier to early detection. Therefore, the program's emphasis on educating and training cadres to use the FRAIL questionnaire is one of its most impactful outcomes. By empowering these frontline community health workers, we help create a sustainable model for ongoing screening and early referral. This approach aligns perfectly with Indonesia's strategy of strengthening community-based healthcare through programs like Posyandu Lansia to manage the health of its rapidly aging population.

This study has several limitations. As a single-day, cross-sectional screening, it cannot establish causality. Furthermore, the voluntary participation may have resulted in a selection bias, potentially underestimating the true burden of frailty by missing less mobile individuals. Despite these limitations, the study provides invaluable real-world data on community health status and successfully demonstrates the feasibility of integrating dual diabetes and frailty screening into public health initiatives.

Conclusion

In conclusion, this PKM EDU program confirmed a high burden of diabetes and frailty among older adults in Gunung Anyar District. The findings highlight an urgent need for primary care systems to move beyond siloed disease management towards integrated, geriatric-focused care. Future efforts should focus on longitudinal follow-up of identified cases, implementing targeted interventions combining physical activity, nutritional support, and diabetes education, and scaling up the training of health cadres to create a robust community-based system for preventing and managing frailty and its comorbidities.

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