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Acceptability and adoption of community-based primary care for non-communicable diseases among Indonesian healthcare workers

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ABSTRACT

Introduction: Public health is confronted with the formidable problem of increased morbidity and mortality rates due to non-communicable diseases (NCDs). Primary healthcare is vital for delivering fundamental healthcare services and improving health outcomes, especially in countries with limited resources. However, studies on the evaluation and adoption of community-based primary health care are limited. This study aimed to assess the extent to which NCD management parameters were accepted and implemented by health care workers.

Methods: This cross-sectional study was conducted in Klaten Regency, Indonesia. Healthcare workers involved in implementing NCD prevention and management programs, including doctors, nurses, and midwives, were recruited using convenience sampling. The independent variables included knowledge, beliefs, health worker perceptions, patient needs and resources, and readiness for implementation. Acceptability and adoption of NCD management among primary healthcare workers were the outcome variables. Data were collected using questionnaires and analyzed using multiple linear regression with a significance level of 0.05.

Results: Multiple linear regression analysis indicated that readiness for implementation was the only significant predictor of acceptability (p = 0.001). Adoption was significantly predicted by patient need and resources (p = 0.003) and readiness for implementation (p = 0.001). Other variables in the model were not significant.

Conclusions: This study found a moderate level of acceptability of NCD prevention and management among healthcare workers in primary care. Readiness was the only factor related to the acceptance and adoption of NCD prevention and management.

Keywords: acceptability, adoption, non-communicable diseases, prevention and management, primary health center

Introduction

Non-communicable diseases (NCDs) represent a major global health challenge. According to the Global Burden of Disease Study 2023, NCDs account for approximately 74% of global deaths, with cardiovascular disease, cancer, chronic respiratory disease, and diabetes as the leading contributors to premature mortality. In Indonesia, the burden is similarly critical, as NCDs contribute to 79% of total deaths, with an increasing prevalence of hypertension, diabetes, stroke, and cardiovascular disease (Ministry of Health, Riskesdas 2018). The recently released National Health Survey (SKI

2023) also reports a continuing rise in metabolic and behavioral risk factors, including obesity, physical inactivity, tobacco exposure, and unhealthy dietary patterns. This escalating burden underscores the urgent need for effective and sustainable NCD prevention and management strategies.

Primary healthcare (PHC) plays a central role in the prevention and management of NCDs, particularly in low-resource settings where access to specialized services is limited. (Organization, 1978; Beaglehole et al., 2008; Rohde et al., 2008; Dodd et al., 2019). PHC enables early detection of risk factors, continuity of care, self-management support, and affordable community-based services, which are critical elements for chronic disease control. Evidence demonstrates that strong PHC systems can significantly improve health outcomes and reduce premature mortality through cost-effective and culturally appropriate community engagement models(Alvarez et al., 2016; Bitton et al., 2017; Dodd et al., 2019). In contrast to acute conditions, NCD management requires long-term follow-up, behavioral modification, and adherence to treatment across the life course, illustrating why PHC is the most appropriate platform for effective NCD response. (Beaglehole et al., 2008). Strengthening PHC capacity is therefore essential for addressing the increasing burden of NCDs and advancing national progress toward SDG target 3.4 (Dineen-Griffin et al., 2019).

Although the importance of primary healthcare in NCD prevention and management is widely acknowledged, there is limited empirical evidence on the acceptability and adoption of NCD services among primary healthcare providers, particularly in low- and middle-income settings such as Indonesia. (Albelbeisi et al., 2021; Kabir, Karim and Billah, 2021). Acceptability has become a critical determinant of successful implementation because interventions are unlikely to be delivered effectively or sustained over time if they are not perceived as appropriate, feasible, and valuable by those responsible for their delivery (Council, 2008). High acceptability among healthcare workers promotes engagement, consistent use, and better patient outcomes, whereas low acceptability can lead to poor adherence, reduced intervention fidelity, and ultimately compromised program effectiveness (Diepeveen et al., 2013; Stok et al., 2015). Despite growing global interest in implementation outcomes, research examining acceptability in the context of PHC-based NCD programs remains sparse, highlighting the need for studies that investigate factors influencing provider readiness and willingness to implement such initiatives(Fisher et al., 2006; Hommel et al., 2013).

Furthermore, health care providers should embrace the approach starting with the first stage of the transition to ensure a smooth implementation of NCD management. This is because early acceptance is crucial for the effective distribution of NCD management. (Mohammadi, Poursaberi and Salahshoor, 2018) It is possible to achieve this goal by utilizing Rogers' theory of the diffusion of innovation, which offers a conceptual framework for determining the elements that encourage the acceptance of innovations and the procedures that are associated with their adoption. (Eccleston and Crombez, 1999; Jeong et al., 2017) The concept makes it possible to investigate the process by which particular therapeutic actions are adopted and directs attention to the perceived novelty qualities that gradually increase adoption. (Sahin, 2006) Effective adoption elements, according to Rogers, are innovative qualities. In his view, the factors that determine an innovation's acceptance and spread within its target therapeutic community are its relative advantage, compatibility, simplicity, observability, and trialability. According to the author, one may predict how widely adopted an innovation will be by looking at how people perceive its features. In addition, the author claims that the theory of innovation dissemination lays out all the necessary components to facilitate the spread of innovative ideas (Greenhalgh et al., 2004).

Few studies have evaluated the acceptability and implementation of community-based primary care for noncommunicable illnesses among Indonesian healthcare professionals. A full analysis of the acceptability and implementation of basic healthcare remains mostly unexplored. Reducing the incidence of noncommunicable illnesses requires improved planning, optimum use of resources, and fulfillment of all health demands. To achieve this, the implementation and acceptance of the primary-level healthcare system is necessary. This study aimed to prevent and manage NCDs by investigating the acceptability and efficacy of the primary health care system. In Indonesia and similar contexts throughout the world, this study will fill a significant knowledge gap and guide public health decisions for the control and prevention of noncommunicable illnesses.

Healthcare System and Non-communicable Disease Response in Indonesia

Indonesia is the world's largest archipelago, comprising approximately 17,504 islands and more than 240 million people with diverse sociocultural characteristics. Following decentralization in 1999, responsibility for health service delivery shifted to provincial and district governments, resulting in variability in program implementation and resource allocation across regions (Rintani & Wibowo, 2019). Within this system, primary healthcare facilities *(Puskesmas)* and community-based service networks play a strategic role in national efforts to prevent and control non-communicable diseases (NCDs). The government has strengthened its commitment through the National Mid-Term Development Plan and the National Action Plan for NCDs, as well as community empowerment

initiatives such as GERMAS. Central to these efforts is *Posbindu PTM*, a community-based screening platform that engages trained health cadres to identify risk factors and refer individuals to *Puskesmas* for diagnostic evaluation and ongoing management (Nugraheni & Hartono, 2022; Siswati et al., 2022). Evidence indicates that participation and service utilization at *Posbindu* remain inconsistent owing to barriers, including limited awareness, staffing constraints, and insufficient readiness at the primary care level (Untad, 2022; Fatimah et al., 2023; Nur'Ilmi et al., 2025). Strengthening PHC capacity, supported by integrated community-level screening and early detection, is considered essential to improving NCD outcomes (Sutarsa et al., 2023).

Despite extensive policy initiatives, there is limited empirical evidence on the acceptability and adoption of NCD services among primary healthcare workers in Indonesia, who play a critical frontline role in implementing national strategies (Albelbeisi et al., 2021; Kabir, Karim & Billah, 2021). Acceptability has become increasingly central in implementation research, as it determines whether health interventions are delivered effectively and sustained in routine practice. Successful implementation depends on the perceived appropriateness, feasibility, and value of interventions among those responsible for delivery (Diepeveen et al., 2013; Stok et al., 2015). High acceptability enhances engagement, adherence, and fidelity, whereas low acceptability can undermine clinical outcomes and weaken overall program effectiveness (Fisher et al., 2006; Hommel et al., 2013). Given the persistent burden of NCDs and the essential role of primary healthcare in early detection, continuity of care, affordability, and community engagement, evaluating acceptability and adoption within PHC systems is necessary to identify barriers and accelerate effective NCD service delivery in Indonesia.

Materials and Methods

Study design and setting

This study was conducted using a cross-sectional survey design in Klaten Regency, a district consisting of 26 sub-districts and 34 public health centers, from February to March 2021. At the time of data collection, there were 13 community-integrated service units for NCD prevention and management, known locally as *Posbindu PTM* (Community-Based Integrated NCD Post). *Posbindu PTM* is a community-based health service platform led by primary care providers and trained community health cadres, focusing on early detection, health education, risk factor monitoring, and referral for non-communicable diseases. These units serve as a key interface between community members and the primary health care system, supporting ongoing prevention and management initiatives for chronic diseases at the grassroots level.

In this study, "community-based primary care NCD management" refers to an integrated service model involving both *Posbindu PTM* activities and Puskesmas-based chronic care services. *Posbindu PTM* functions as a community-level platform for early detection, health education, risk factor monitoring, and referral, whereas *Puskesmas* provides follow-up clinical management, continuity of care, and coordination of NCD services. Healthcare workers participating in this study were involved in one or both components of this integrated model. Accordingly, the outcomes assessed in this study reflect healthcare providers' perceptions of the implementation, acceptability, and adoption of NCD management within this integrated community-based primary care framework, rather than objective service delivery indicators.

Sample

This study included healthcare workers involved in implementing the NCD prevention and management program, including doctors, nurses, and midwives. Of the 744 eligible workers, 15 were on maternity leave and 14 had incomplete data; therefore, 715 participants were included in the final analysis. Convenience sampling was used to recruit participants.

Instruments

A checklist of demographic information is as follows: The individual characteristics of the participants were considered for this checklist. These characteristics included age (year), gender (male or female), education level, and job experience (year).

Acceptability was evaluated using the Acceptability of Intervention Measure (AIM), which was designed by Weiner et al. (2017) and comprised four items. Items were rated using a Likert scale with five points, ranging from 1 (which indicates "strongly disagree") to 5 (which indicates "strongly agree"). Weiner et al. (2017) conducted a series of three investigations, each of which proved that the AIM possessed significant psychometric features. In the context of Indonesia, the content validity of the questionnaire was evaluated by specialists, and the evaluation found that both the face validity and content validity of the questionnaire were satisfactory (CVI = 0.98). To verify the internal consistency and stability of the data, the Cronbach 'salpha and ICC methodologies were utilized. Both the α value of 0.82 and the ICC value of 0.94 were found to be satisfactory.

Adoption was defined as the degree to which healthcare workers were willing to integrate and routinely use the NCD management program in clinical practice. Adoption was assessed using eight items based on Rogers' Diffusion of Innovation Theory (Rogers, 2019), scored on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). Linguistic and content validation were conducted by experts in Indonesia, yielding acceptable results (CVI = 0.83). Reliability testing

demonstrated good internal consistency and stability (Cronbach's α = 0.79; ICC = 0.89). In the context of Indonesia, the content validity of the questionnaire was evaluated by specialists, and the evaluation found that both the face validity and content validity of the questionnaire were satisfactory (CVI = 0.83). To verify the internal consistency and stability of the data, Cronbach 'salpha and the ICC methodology were utilized. Both the α value of 0.79 and the ICC value of 0.89 were satisfactory.

The Consolidated Framework for Implementation Research (CFIR) was utilized to evaluate the acceptance and implementation of NCD management parameters. These factors include the perception of health workers regarding the evidence that NCD interventions can be implemented (four items), patient need and resources (outer setting) regarding organizational priorities toward patient needs and barriers to facilitators/program implementers (three items), readiness for implementation (inner setting) regarding organizational commitment to implementing the program (seven items), knowledge (14 items), and belief about the intervention (characteristics of the intervention) (four items). Items were assessed using a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Intervention (four of nine), outer setting (three of five), inner setting (seven of 11), individual characteristics (14 of 18), and procedure were evaluated for validity and reliability (four of eight).

Procedure

Ethical approval was obtained from the Health Research Ethical Clearance of the Faculty of Medicine, Universitas Sebelas Maret (9178/UN27.06.6.1/KEPK/EC/2020). To collect data, the researchers visited primary care clinics and obtained permission from the respective offices to access information on the number of healthcare workers at each site. Questionnaires were administered to the healthcare workers, and they were instructed to complete them at their own pace, regardless of the time constraints they faced. The next day, the responses to the questionnaires were received from the healthcare professionals.

Data analysis

Data were analyzed using SPSS (version 25.0; SPSS Inc., Chicago, IL, USA). The Kolmogorov–Smirnov test indicated that the data were normally distributed. Bivariate analyses were conducted using the chi-square test or Fisher's exact test for categorical variables, depending on data characteristics, and Pearson 'scorrelation for continuous variables. Differences between the two groups were analyzed using the independent t-test, while analysis of variance was applied for comparisons among the three groups. Variables with two-sided p values of 0.05 or less in the bivariate analysis were entered into the linear regression model, and only variables with p values below this threshold are reported.

Results

The mean age of the 715 participants who answered the questionnaire was 38.91 (SD=11.35). Most were female (89%), more than half had a Diploma III education level (69.1%), and 87.4% did not receive NCD management training. The average work experience was 15.72 (SD=5.20). The analysis showed that demographic characteristics, including age, sex, education level, work experience, and training status, were not significantly associated with either acceptability or adoption of the

Table 1. Demographic data and their association with acceptability and adoption of NCD management

Variables	N (%)	Acceptability		Adoption	
		Mean ± SD	p-value	Mean ±SD	p-value
Age (year), Mean ±SD	38.91±11.35		0.152[c]		0.087
Gender					
Male	79 (11.0)	3.57±1.24	0.538[a]	2.88 ± 0.60	0.153[a]
Female	636 (89.0)	3.15±0.89		2.98 ± 0.65	
Education level					
Diploma III	494 (69.1)	3.02±1.15	0.263[b]	2.87±0.72	0.416[b]
Bachelor	114 (15.9)	3.51±0.99		3.31±0.45	
Profession	96 (13.4)	3.47±1.31		3.06±1.11	
Working experience (year), Mean ± SD	15.72±5.20		0.367[c]		0.138[c]
Training experience on NCDs management					
Yes	90 (12.6)	3.78±1.68	0.073[a]	3.35±0.79	0.154[a]
No	625 (87.4)	3.12±1.52		2.78±0.56	

Note: [a] p-value obtained from t test, [b] p-value obtained from ANOVA test; [c] p-value obtained from Pearson Correlation test

Table 2. Descriptive statistics of the studied variables

Variables	Mean ± SD
Acceptability	3.15±0.95
Adoption	2.97±0.65
Knowledge	3.21±1.37
Belief	3.32±1.62
Perception of health workers	2.98±0.47
Patient need and resources	3.72±1.45
Readiness for implementation	2.16±0.36

Table 3. Correlations Between Key Variables and Acceptability of NCD Management Program in Primary Care

Variables	Acceptability	Knowledge	Belief	Perception of Health Workers	Patient Need & Resources	Readiness for Implementation
Acceptability	1					
Knowledge	0.196	1				
Belief	0.159	0.266	1			
Perception of health workers	0.205	0.394***	0.342***	1		
Patient need & resources	0.296	0.293	0.586***	0.424***	1	
Readiness for implementation	0.596***	0.455***	0.237	0.345**	0.248	1

Note: $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Correlation test: Pearson correlation coefficients

Table 4. Correlations Between Key Variables and Adoption of NCD Management Program in Primary Care

Variables	Adoption	Knowledge	Belief	Perception of Health Workers	Patient Need & Resources	Readiness for Implementation
Adoption	1					
Knowledge	0.357**	1				
Belief	0.218	0.391**	1			
Perception of health workers	0.121	0.175	0.278	1		
Patient need & resources	0.476***	0.291	0.361**	0.111	1	
Readiness for implementation	0.372**	0.352**	0.304**	0.227	0.218	1

Note: $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Correlation test: Pearson correlation coefficients

Table 5. Factors Associated with Acceptability and Adoption of NCD Management Program in Primary Care

Dependent Variable	Independent Variable	B	SE	95% CI	p-value
Acceptability	Knowledge	1.047	0.614	−0.156 – 2.250	0.086
	Belief	0.915	0.642	−0.343 – 2.173	0.156
	Perception of health workers	1.872	1.126	−0.335 – 4.079	0.097
	Patient need & resources	1.928	1.831	−1.662 – 5.518	0.294
	Readiness for implementation	4.549	1.904	0.817 – 8.281	0.001*
Adoption	Knowledge	1.403	1.678	−1.885 – 4.691	0.189
	Belief	1.985	0.870	−0.279 – 4.249	0.064
	Perception of health workers	0.645	0.143	−0.135 – 1.425	0.111
	Patient need & resources	3.727	0.773	2.212 – 5.242	0.003*
	Readiness for implementation	4.555	0.746	3.093 – 6.017	0.001*

*Significant at $p < 0.05$
p-value obtained from the linear regression test.

NCD management program ($p > 0.05$), as presented in Table 1.

The descriptive results in Table 2 show that the mean scores for acceptability, adoption, knowledge, belief, perception of health workers, patient need and resources, and readiness for implementation were 3.15 ± 0.95, 2.97 ± 0.65, 3.21 ± 1.37, 3.32 ± 1.62, 2.98 ± 0.47, 3.72 ± 1.45, and 2.16 ± 0.36, respectively.

Pearson 'scorrelation analysis demonstrated that readiness for implementation was strongly positively correlated with the acceptability of the NCD management program ($r = 0.596$, $p < 0.001$), whereas patient need and resources showed the strongest correlations with adoption ($r = 0.476$, $p < 0.001$). Other independent variables demonstrated weak or nonsignificant correlations (Tables 3 and 4).

Multiple linear regression analysis showed that readiness for implementation was the only significant predictor of acceptability ($B = 4.55$, $p = 0.001$), indicating that organizational preparedness played a central role in shaping healthcare workers' acceptance of the NCD management program. For adoption, both perceived patient needs and resources ($B = 3.73$, $p = 0.003$) and readiness for implementation ($B = 4.56$, $p = 0.001$) were significant predictors. Other variables, including knowledge, beliefs, and perceptions of health workers, were not independently associated with adoption after adjusting for contextual factors (Table 5).

Discussions

The Healthcare workers surveyed in this study had a modest level of acceptance for the management of noncommunicable diseases in primary care. Noncommunicable disease (NCD management interventions can be intricate, including several interacting components and being administered at different organizational levels (Council, 2008). Healthcare intervention designers have the difficult task of creating efficient therapies that maximize clinical outcomes within the constraints of existing resources (Torgerson, Ryan, and Donaldson, 1995). There may be a correlation between the low level of acceptability for NCD management programs and their potential detrimental impact on program efficacy (Borrelli et al., 2005). The

results of this study also showed that primary care providers in Indonesia were not very open to the idea of managing NCDs. According to an additional study, the perception of advantages, including cost-effectiveness, prospective benefits, and the consequences of the intervention on the promotion of clinical care-20, is greatly influenced by adoption.

The primary care system in Indonesia is extremely centralized when considering the management structure, organizational hierarchy, allocation of resources, deployment of staff, health-seeking behavior, and sociocultural elements of the population. The planned research will help the NCD service delivery system by filling important data gaps. To evaluate the readiness of the current health system and ascertain whether improved NCD services are necessary at the population level, this study will offer thorough data that reflect the holistic characteristics of the primary care system that operates at the subdistrict level. To create a primary care NCD service system in Indonesia that is successful, needs-based, and patient-centered, the results of this study will be useful for policymakers, program implementers, healthcare providers, and community members. In summary, the results will help public health officials in Indonesia and other comparable countries make better judgments about the treatment and prevention of noncommunicable care system.

This study found that readiness is the only factor related to acceptance. NCDs prevention and management program readiness is a function of leadership supervision and coordination, adequate resources, and appropriate time for implementation. Readiness involves dimensions such as leadership, supervision, coordination, availability of human and material resources, and adequate time allocation for implementation, all of which influence the effectiveness with which innovations are integrated into service delivery. (Sfantou et al., 2017). When readiness is high, primary care teams are more likely to perceive interventions as feasible, beneficial, and aligned with their clinical priorities, resulting in greater adoption and program sustainability.

In the Indonesian context, this finding is strongly connected to the operational realities of *Posbindu PTM*, a community-based chronic disease screening and education program that plays a strategic frontline role in NCD prevention and management. *Posbindu* is staffed largely by nurses and community health cadres whose responsibilities include health promotion, community mobilization, and referral coordination. However, the effectiveness of *Posbindu* depends heavily on local health system readiness, particularly leadership support from the *Puskesmas* head, resource allocation for screening tools and training, and alignment between workload demands and chronic disease service priorities. International readers may interpret *Posbindu* as a hybrid mechanism bridging community engagement and clinical follow-up within a decentralized primary care environment, thus emphasizing how readiness becomes central to ensuring its success.

Despite expectations, knowledge, beliefs, and perceptions of health workers did not significantly influence acceptability or adoption. This may be related to the limited exposure of respondents to NCD management training and insufficient familiarity with structured implementation frameworks. Most participants reported not having received formal training related to the NCD management program, which may have constrained their understanding of the program's benefits and potentially reduced their willingness to adopt it. Previous studies have noted that training initiatives significantly enhance confidence and program engagement, particularly when aligned with perceived clinical priorities (Zlateva et al., 2021;Sulistyowati et al., 2017). It also highlighted the need to emphasize the benefits of NCDs in training interventions for healthcare workers in primary care to increase their acceptability and adoption of NCD management programs. In designing a training program to improve NCD adoption, part of the program should be allocated to training on the advantages of the practice. Belief has not had a substantial impact on acceptance and adoption. This is because of the lack of evidence and expertise in implementing NCD prevention and management programs by health practitioners. The healthcare workforce has not been provided with a reliable resource to guide the execution of activities. Therefore, a priority for strengthening primary care capacity is to integrate NCD management into standard training curricula, emphasize practical competencies, intervention benefits, and evidence-based implementation resources(Belza et al., 2015). To improve the comprehension and confidence of implementers, interventions that concentrate on removing barriers and bolstering facilitators must be planned and created (Fathnezhad-Kazemi & Hajian, 2019).

The findings suggest several practical implications for policymakers and health system leaders. First, improving implementation readiness through stronger leadership engagement, structured supervision systems, and guaranteed resource allocation may accelerate the adoption of NCD programs. Second, enhancing patient need responsiveness, such as adapting service schedules, improving community health literacy, and reducing logistical barriers, could increase service utilization and program sustainability. Third, institutionalizing routine training and competency development for *Posbindu* and *Puskesmas* staff, including cadres, could improve confidence and integration of NCD interventions into routine care. These changes would support national efforts to reduce the growing NCD

burden and strengthen Indonesia's primary care transformation agenda.

Although the findings offer meaningful insights, several limitations should be acknowledged. First, the study used a cross-sectional design, which limited causal interpretation. Second, the relatively small sample size and single-site sampling constrained generalizability. These limitations highlight the need for future multi-site studies to validate findings across diverse regions and health system contexts. Further qualitative exploration involving primary care staff, health cadres, and community members may reveal deeper barriers and facilitators to NCD implementation readiness. Longitudinal or implementation science approaches could also evaluate how readiness evolves over time and influences real-world outcomes.

Conclusion

This study found a moderate level of acceptability of NCD prevention and management among healthcare workers in primary care. Readiness was the only factor related to the acceptance and adoption of NCD prevention and management. NCD prevention and management program readiness is a function of leadership supervision and coordination, adequate resources, and appropriate time for implementation. This study highlights the critical factors influencing the implementation of NCD prevention and management programs in primary health centers. The findings may inform policymakers and stakeholders in strengthening current service delivery, establishing minimum standards of care at the primary and secondary levels, and advancing equitable access to NCD services throughout Indonesia.

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Availability of data and materials

The datasets generated and/or analyzed in the current study are not publicly available because of patient confidentiality and institutional privacy regulations. However, de-identified data may be available from the corresponding author upon reasonable request and with permission from the research ethics committee of RSUD Dr. Soetomo.

Authors' contributions

GPD contributed to the conceptualization, data collection, statistical analysis, and manuscript drafting.

AK supervised the research process, provided critical revisions, and contributed to the interpretation of psychiatric aspects related to personality traits and quality of life.

ME supervised the study design, particularly the orthopedic aspects, and contributed to the clinical interpretation of findings related to knee osteoarthritis and total knee replacement outcomes.

AA contributed to methodological guidance, statistical analysis, and the interpretation of public health perspectives in this study.

All authors reviewed and approved the final version of the manuscript.

Declaration of Interest

The authors declare that they have no financial, professional, or personal conflicts of interest that could inappropriately influence or bias the research presented in this manuscript.

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