CORRELATION BETWEEN HANDGRIP STRENGTH AND PULMONARY FUNCTION PARAMETERS (% PREDICTED) IN AN URBAN ADULT POPULATION

Yohanes Firmansyah[1], Ajeng Tias Endarti[2*], Nur Asniati Djaali[3], Ernawati[4]

[1-3]Faculty of Health, Universitas Mohammad Husni Thamrin
[1,4]Faculty of Medicine, Universitas Tarumanagara

Correspondence Author: endarti.ajeng@gmail.com

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ABSTRACT

Handgrip strength is a simple indicator of peripheral muscle strength that may reflect pulmonary function status, particularly in urban adult populations exposed to high levels of air pollution. However, empirical evidence regarding the association between handgrip strength and predicted pulmonary function parameters in Indonesia remains limited. This study aimed to analyze the correlation between handgrip strength and pulmonary function parameters (% predicted) in an urban adult population. An observational analytic study with a cross-sectional design was conducted among 539 adults (≥18 years) across five administrative regions of DKI Jakarta. Pulmonary function parameters assessed included vital capacity (VC), forced vital capacity (FVC), forced expiratory volume in one second (FEV_1), and the FEV_1/FVC ratio, all expressed as % predicted. Handgrip strength was measured bilaterally and averaged. Univariate and bivariate analyses were performed using Spearman's correlation test. Mean handgrip strength showed a significant positive correlation with VC (% predicted) ($r = 0.182$; $p < 0.001$) and FVC (% predicted) ($r = 0.222$; $p < 0.001$). A weaker positive correlation was observed between left-hand grip strength and FEV_1 (% predicted) ($r = 0.091$; $p = 0.034$). In contrast, the FEV_1/FVC ratio (% predicted) demonstrated consistent and significant negative correlations with right-hand, left-hand, and mean handgrip strength (r ranging from −0.186 to −0.200; $p < 0.001$). Handgrip strength is significantly associated with pulmonary function capacity (% predicted), particularly volume-related parameters, and may serve as a simple screening indicator of pulmonary function in urban adult populations.

Keywords: Handgrip, Pulmonary Function, Spirometry, Adults, Urban Population.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) and other pulmonary function disorders have become a major global health burden, ranking as the third leading cause of death worldwide, with approximately 3.5 million deaths in 2021, accounting for about 5% of all global mortality. Globally, an estimated 200 million people live with COPD, with a prevalence of 10.6% of the world population, and this figure is projected to continue rising due to increasing air pollution exposure, tobacco use, and population aging. In Asia, the burden of chronic respiratory diseases is particularly high, with COPD cases reaching 10.5 million in 2021 (age-standardized incidence rate: 210.79 per 100,000 population). South Asia and East Asia bear the greatest burden, although East Asia has demonstrated a significant decline in mortality and disability-adjusted life years (DALYs) over the past three decades. In Indonesia, data from the 2018 National Basic Health Research (Riskesdas) indicate a national COPD prevalence of 3.7%, corresponding to approximately 9.2 million individuals, with the highest prevalence observed in East Nusa Tenggara (10%) and relatively lower prevalence in urban regions such as DKI Jakarta (6.3% overall and 2.7% among men). Nevertheless, as a metropolitan capital with the highest levels of air pollution in Indonesia, Jakarta experiences substantial respiratory health impacts. Reports from the Ministry of Environment and Forestry indicate that 57.8% of DKI Jakarta residents are affected by cardiovascular diseases and respiratory infections attributable to air pollution exposure, with an estimated 2.7 million cases of acute respiratory infections (ARI). In 2023, PM2.5 concentrations in Jakarta reached 43.8–46.1 μg/m³, exceeding the Indonesian national standard (15 μg/m³) by threefold and the World Health Organization guideline (5 μg/m³) by nearly ninefold. Moreover, a study conducted in the industrial area of Pulo Gadung reported a prevalence of pulmonary function impairment of 38.5% among adults exposed to indoor PM2.5 concentrations as high as 308 μg/m³.(Alamsyah et al., 2022; Boers et al., 2023; Pattinaja, 2025; Pramitha & Haryanto, 2019; Reilly, 2023; Willard et al., 2025; World Health Organization (WHO), 2007; Wu et al., 2025, 2025)

Handgrip strength (HGS) is acknowledged as a straightforward, non-invasive, and reliable measure for evaluating overall skeletal muscle strength, indicating both peripheral muscle mass and the functional capacity of respiratory muscles, including the diaphragm, intercostal muscles, and accessory respiratory muscles. The consensus statements from the European Working Group on Sarcopenia in Older People (EWGSOP) and the Asian Working Group for Sarcopenia (AWGS) identify handgrip strength (HGS) as a crucial element in diagnosing sarcopenia and "possible sarcopenia," due to its significant predictive value for various health outcomes, including mortality, disability, cardiovascular disease, type 2 diabetes mellitus, fractures, and deterioration in functional capacity. The assessment of handgrip strength (HGS) presents significant practical benefits: the dynamometer is portable, cost-effective, non-invasive, amenable to repeated assessments, and delivers objective data promptly without necessitating considerable technical expertise. Validation tests indicate that portable devices like Activ5 possess exceptional validity and reliability (Lin's intraclass correlation coefficient: 0.99), along with commendable sensitivity and specificity for identifying declines in muscle strength and the danger of sarcopenia. In basic healthcare environments, HGS can work as an initial screening instrument to detect patients susceptible to pulmonary function deterioration, especially in institutions with restricted access to spirometry. A handgrip strength (HGS) cutoff of 28 kg in men exhibits a sensitivity of 84% and a specificity of 96% (AUC: 0.92) for identifying poor walking speed as a marker of sarcopenia, whereas a cutoff of 20 kg in women reveals 100% sensitivity and 91% specificity (AUC: 0.95). Furthermore, handgrip strength (HGS) has been suggested as an essential "vital sign of health" to be incorporated into standard clinical evaluations for health risk stratification, given that each 5-kg reduction in HGS correlates with a 16% rise in all-cause mortality risk, a 21% increase in cardiovascular disease risk, and a 9% elevation in stroke risk.(Huang et al., 2025; Jerrald Felix et al., 2022; Kemala Sari et al., 2025; Manda et al., 2021; Pino-Ortega et al., 2025; Sawaya et al., 2020; Soares et al., 2023; Vaishya et al., 2024)

The urgency of investigating the correlation between handgrip strength and pulmonary function in the urban setting of Jakarta is particularly high, given the substantial economic and health burdens imposed by pulmonary function impairment and sarcopenia in the context of extreme urban pollution exposure. COPD is estimated to have cost Indonesia more than IDR 1,499 trillion between 2020 and 2025, while air pollution in Jakarta alone is estimated to result in economic losses of approximately IDR 1.8 trillion annually, accompanied by around 3,000 deaths and 90 million cases of respiratory symptoms each year. At the same time, the prevalence of sarcopenia among the Asian elderly population is remarkably high; studies in China report that 46–52.79% of older adults have possible sarcopenia, with prevalence increasing in parallel with advancing age and comorbidity burden. Within the context of Jakarta’s rapidly aging urban population, chronic exposure to PM2.5 pollution, and a high prevalence of sedentary lifestyles, understanding the relationship between peripheral muscle strength—measurable simply through handgrip strength—and pulmonary function status is crucial for the development of cost-effective screening and early intervention strategies. To date, most studies examining the HGS–pulmonary function relationship have been conducted in populations with limited age ranges, in patients with established chronic lung disease, or in countries with different environmental exposure profiles. Consequently, data derived from heterogeneous urban populations with high pollution exposure, such as Jakarta, remain scarce but are essential for elucidating the dynamics of the muscle–lung axis within the urban Indonesian context. This study is expected to provide empirical evidence regarding the strength and pattern of correlations between handgrip strength and predicted pulmonary function parameters, which may be used to inform the development of simple screening tools, identify high-risk groups for preventive interventions, and support public health policies aimed at preventing respiratory and musculoskeletal diseases in densely populated and polluted urban environments.(Chen et al., 2022; Choi et al., 2025; Deng et al., 2025; Health Policy Partnership, 2025; Meng et al., 2024; Mgbemena et al., 2019; Ohara et al., 2020; Sawaya et al., 2020; Yao et al., 2022; Zhu et al., 2020)

LITERATURE REVIEW

Pulmonary function deteriorates progressively with age, with forced vital capacity (FVC) diminishing by approximately 20–25 mL annually post-40 years, and forced expiratory volume in one second (FEV_1) decreasing by 20–35 mL per year between ages 25 and 40, escalating to 40–60 mL per year in individuals aged 70 and above. The decline is attributable to structural changes in the lungs, including diminished tissue elasticity, alveolar enlargement, and heightened residual volume, as well as mechanical modifications of the chest wall, characterized by increased thoracic stiffness and decreased strength of the diaphragm and intercostal muscles. In urban environments like Jakarta, this age-related deterioration in pulmonary function is further intensified by prolonged exposure to elevated levels of fine particulate matter (PM2.5). In 2023, the yearly average PM2.5 concentration in Jakarta was 43.8–46.1 µg/m³, surpassing the Indonesian national norm (15 µg/m³) by three times and the World Health Organization recommendation (5 µg/m³) by almost nine times. Prospective studies in urban populations have shown that elevated PM2.5 exposure is significantly correlated with decreases in FEV_1 (adjusted coefficient: −0.45 L; 95% CI: −0.58 to −0.32; $p < 0.001$) and FVC (adjusted coefficient: −0.55 L; 95% CI: −0.70 to −0.40; $p < 0.001$), as well as an augmented risk of chronic respiratory disease (adjusted OR: 2.45; 95% CI: 1.70–3.55; $p < 0.001$).(Alyami et al., 2025; Chaunchaiyakul et al., 2004; Cho, 2023; Gross et al., 2025; Pramitha & Haryanto, 2019, 2019; Schneider et al., 2021; Wesnawa et al., 2025)

Handgrip strength (HGS) is acknowledged as a straightforward and reliable measure of overall skeletal muscle strength and is deemed essential for diagnosing sarcopenia, as per the consensus of the European Working Group on Sarcopenia in Older People (EWGSOP) and the Asian Working Group for Sarcopenia (AWGS). The assessment of handgrip strength (HGS) possesses significant predictive value for numerous health outcomes, such as mortality, disability, fractures, and deterioration in functional capability within elderly populations. From a physiological standpoint, handgrip strength (HGS) signifies not only peripheral muscle mass but also the total quality of skeletal muscle, encompassing respiratory muscles such as the diaphragm, intercostal muscles, and accessory muscles of respiration, which are essential for sustaining ventilatory capacity. A study involving Japanese older adults in need of long-term care revealed a significant positive correlation between skeletal muscle mass index (SMI) and maximum expiratory pressure (MEP) ($r = 0.344$ for men; $r = 0.393$ for women), suggesting a strong association between peripheral muscle mass and expiratory muscle strength. The mechanisms governing this relationship entail intricate pathways: initially, the engagement of substantial skeletal muscles in the extremities necessitates an elevated oxygen supply, resulting in concomitant development and adaptation of the lungs and respiratory muscles to satisfy metabolic requirements; subsequently, the reduction of muscle mass (sarcopenia) prompts the secretion of pro-inflammatory cytokines such as TNF-α, IL-6, and IL-1ß, which not only expedite additional muscle catabolism but also diminish lung tissue elasticity and hinder ventilatory function. (Akınoğlu et al., 2019; Asoudeh et al., 2022; Choi et al., 2025; Huang et al., 2025; Kemala Sari et al., 2025; Li et al., 2024; Liang et al., 2022; Nelke et al., 2019; Sawaya et al., 2020; Soares et al., 2023; Taivassalo & Hepple, 2022)

This study aimed to analyze the correlation between handgrip strength and pulmonary function parameters (% predicted) in an adult population residing in urban Jakarta. Specifically, the objectives of this study were: (1) to describe the univariate characteristics of participants based on age, sex, handgrip strength (right, left, and mean), and pulmonary function parameters, including vital capacity, forced vital capacity, forced expiratory volume in one second, and the FEV_1/FVC ratio expressed as % predicted; and (2) to examine the bivariate correlations between handgrip strength (right, left, and mean) and each pulmonary function parameter (% predicted).

RESEARCH METHOD

This research was an observational analytic study utilizing a cross-sectional design, conducted throughout five administrative regions of DKI Jakarta Province: West Jakarta, East Jakarta, Central Jakarta, South Jakarta, and North Jakarta. Data collection was conducted consecutively from August 2024 to May 2025 utilizing standardized testing protocols across all research locations. The target population consisted of all individuals aged 18 years and older residing in DKI Jakarta. The study sample comprised individuals from the accessible population who satisfied the inclusion and exclusion criteria.

A non-probability sampling method with a successive sampling strategy was implemented, enrolling all eligible participants sequentially until the minimum requisite sample size was attained. The inclusion criteria comprised individuals aged 18 years or older, residing in DKI Jakarta, demonstrating a desire to engage in all examination processes, and possessing the capability to adequately adhere to instructions for spirometry and handgrip tests. Participants were excluded if they had conditions contraindicating spirometry, including acute respiratory tract infection, fever, unexplained hemoptysis, pneumothorax, unstable cardiovascular conditions, or were in the recovery phase post-thoracic or abdominal surgery.

Additionally, participants were excluded for conditions that hindered handgrip strength assessment, such as acute injury, severe pain, or musculoskeletal or neurological disorders affecting the upper extremities. Pulmonary function was evaluated utilizing a Minato AS-507 spirometer following established protocols, with parameters assessed including vital capacity, forced vital capacity (FVC), forced expiratory volume in one second (FEV_1), and the FEV_1/FVC ratio, all represented as percentages of predicted values based on age, sex, body weight, and height. Handgrip strength was assessed utilizing a CAMRY EH-101 handgrip dynamometer, with two measures recorded for each hand and subsequently averaged.

Anthropometric measurements comprised height evaluated with a OneHealth HT-721 stadiometer and body weight recorded using an OMRON HBF-375 device. Statistical analyses included descriptive analysis to summarize participant characteristics and variable distributions, and bivariate analysis employing Spearman's correlation test to assess the relationship between handgrip strength and pulmonary function measures. This study adhered to the principles of the Declaration of Helsinki and obtained ethical approval from the Universitas Tarumanagara Human Research Ethics Committee, Institute of Research and Community Engagement.

RESEARCH RESULTS

This study included 539 participants aged 18–96 years, with a median age of 52 years. The majority of participants were female (69.8%), while males accounted for 30.2%. The median body weight was 62.5 kg (range: 28.9–130.4 kg), and the median height was 155.1 cm (range: 111.9–189.5 cm). Handgrip strength measurements showed a median of 23.0 kg for the right hand and 21.1 kg for the left hand, with a mean handgrip strength of 22.3 kg, reflecting substantial variability in peripheral muscle strength within the study population. Pulmonary function parameters expressed as percentage of predicted values demonstrated median values of 73% for vital capacity, 66% for forced vital capacity, and 70% for forced expiratory volume in one second.

Table 1. Demographic Characteristics, Anthropometric Measurements, Handgrip Strength, and Pulmonary Function of the Participants

Variable	n (%)	Median	Minimum	Maximum
Age		52	18	96
Gender				
• Male	163 (30,2%)			
• Female	376 (69,8%)			
Body Weight (kg)		62.5	28.9	130.4
Height (cm)		155.1	111.9	189.5
Right-Hand Grip Strength		23	3.2	60.4
Left-Hand Grip Strength		21.1	4.5	61.6
Mean Handgrip Strength		22.3	5.2	60.6
Vital Capacity (%)		73	28	148
Forced Vital Capacity (%)		66	21	120
Forced Expiratory Volume in 1 Second (%)		70	19	142
FEV_1/FVC Ratio (% Predicted)		111	41	137.85

The median FEV_1/FVC ratio (% predicted) was 111%, indicating that expiratory flow function was generally preserved, despite a tendency toward reduced lung capacity relative to predicted values in a proportion of participants.

Table 2. Correlation between Handgrip Strength and Pulmonary Function Parameters (% Predicted)

Variable		*Vital Capacity (%)*	*Forced Vital Capacity (%)*	*Forced Expiratory Volume in 1 second (%)*	FEV_1/FVC Ratio (% Predicted)
Right-Hand Grip Strength	*Correlation Coefficient*	.167**	.204**	0.075	-.186**
	Sig. (2-tailed)	0.000	0.000	0.081	0.000
Left-Hand Grip Strength	*Correlation Coefficient*	.182**	.223**	.091*	-.194**
	Sig. (2-tailed)	0.000	0.000	0.034	0.000

Mean Handgrip Strength	*Correlation Coefficient*	.182**	.222**	0.083	-.200**
	Sig. (2-tailed)	0.000	0.000	0.053	0.000

Based on the correlation analysis (Spearman Correlation), handgrip strength demonstrated statistically significant but relatively weak associations with several pulmonary function parameters expressed as percentage of predicted values. Mean handgrip strength showed significant positive correlations with vital capacity (% predicted) (r = 0.182; p < 0.001) and forced vital capacity (% predicted) (r = 0.222; p < 0.001), indicating that individuals with greater peripheral muscle strength tended to have relatively higher lung capacity compared with their predicted values. A weaker positive correlation was also observed between left-hand grip strength and forced expiratory volume in one second (% predicted) (r = 0.091; p = 0.034), whereas the correlation with mean handgrip strength did not reach statistical significance. In contrast, the FEV_1/FVC ratio (% predicted) exhibited consistent and significant negative correlations with right-hand, left-hand, and mean handgrip strength (r ranging from −0.186 to −0.200; p < 0.001), suggesting that increased muscle strength was not accompanied by a proportional increase in expiratory flow ratio relative to lung capacity (Table 2).

DISCUSSION

This study illustrates that handgrip strength is strongly, though slightly, correlated with pulmonary function measures in Jakarta's metropolitan population. The observed positive correlations between mean handgrip strength and vital capacity (% predicted) (r = 0.182; p < 0.001) and forced vital capacity (% predicted) (r = 0.222; p < 0.001) align with findings from various studies in healthy populations across different countries, although the correlation strengths in this study are generally lower. A study in Nigeria with young adults aged 16–30 revealed significant connections between handgrip strength and projected FVC (r = 0.27–0.34), but a health screening study in Japan (n = 1,622) identified correlation coefficients of roughly 0.3–0.45 after sex stratification. The variations in correlation strength may be attributed to other causes. The Jakarta study encompassed a broad age spectrum (18–96 years, median age 52 years), illustrating various stages of aging and functional capacity. The utilization of percentage of projected values adjusted for anthropometric variables generally diminishes the strength of correlation in comparison to absolute values. The diversity of Jakarta's metropolitan population, marked by differing levels of air pollution exposure, sedentary habits, and socioeconomic variation, may further diminish the linear relationship between peripheral muscle strength and lung capacity.(Deng et al., 2025; Ja'afar et al., 2023; Liu et al., 2022; Mgbemena et al., 2019; Ohara et al., 2020; Zhu et al., 2020)

The pathophysiological mechanisms connecting handgrip strength and pulmonary function encompass multiple linked pathways. Initially, handgrip strength signifies overall skeletal muscle strength, encompassing respiratory muscles like the diaphragm, intercostal muscles, and auxiliary respiratory muscles.

Research involving athletes has revealed robust correlations between lower-extremity muscle strength (knee flexors and extensors) and forced vital capacity (FVC) and forced expiratory volume in one second (FEV_1) (r = 0.786-0.813), alongside moderate correlations with respiratory muscle strength measured by maximum inspiratory pressure and maximum expiratory pressure (r = 0.206-0.411). Ultrasonographic evaluations have demonstrated a substantial positive correlation between diaphragmatic thickness and excursion with FVC (r = 0.558) and FEV_1, suggesting that effective respiratory muscle function necessitates sufficient muscle mass and strength. Secondly, systemic inflammatory pathways are pivotal: the reduction of muscle mass (sarcopenia) correlates with elevated concentrations of pro-inflammatory cytokines, including TNF-α, IL-6, and IL-1ß, which not only expedite additional muscle degradation but also compromise lung tissue elasticity and accelerate the deterioration of ventilatory function.

Longitudinal studies indicate that a more rapid reduction in muscle mass index correlates with accelerated reductions in FEV_1 and FVC, along with an elevated risk of respiratory symptom exacerbations. Third, the elevated metabolic requirements of extensive skeletal muscles, especially the quadriceps and hamstrings, necessitate a significant oxygen supply, resulting in concurrent growth and adaptation of the lungs and respiratory muscles to facilitate tissue oxygenation during physical exertion. In urban populations like Jakarta, prolonged exposure to air pollution and sedentary habits may expedite the simultaneous deterioration of muscle strength and pulmonary function via inflammatory mechanisms and oxidative stress. (Akınoğlu et al., 2019; Asoudeh et al., 2022; Byun et al., 2017; Choi et al., 2025; J. Jung & Kim, 2017; Kim et al., 2024; Liang et al., 2022; Mgbemena et al., 2019; Nelke et al., 2019; Ohara et al., 2020; Shin et al., 2017; Zhu et al., 2020)

This study reveals a continuous and significant negative connection between handgrip strength and the FEV_1/FVC ratio (% predicted) (r = −0.186 to −0.200; $p < 0.001$), which may initially seem counterintuitive. This pattern can be elucidated through an understanding of pulmonary physiology and limiting functional patterns. In optimal respiratory muscle function, enhancements in peripheral and respiratory muscle strength typically elevate FVC more significantly than FEV_1, as FVC is closely reliant on the contractile power of inspiratory muscles (diaphragm and external intercostals) and expiratory muscles (abdominal and internal intercostals). Research involving athletes has also revealed negative associations between extremity muscle strength and the FEV_1/FVC ratio (r = −0.268 to −0.284), suggesting that those with enhanced muscular strength display a relatively higher FVC in comparison to FEV_1. This negative connection does not signify airway obstruction; instead, it indicates a predominance of heightened restrictive capacity. In the Jakarta population, these findings indicate that individuals exhibiting greater handgrip strength are likely to possess higher total lung capacity and normal or slightly elevated FEV_1/FVC ratios, aligning with normal pulmonary function or mild compensatory restrictive patterns rather than obstructive impairment. Prior research in healthy cohorts has typically indicated no substantial link between handgrip strength and the FEV_1/FVC ratio, thereby reinforcing the idea that this ratio is less effective in identifying fluctuations in muscle strength compared to FVC or FEV_1 evaluated separately. (Akınoğlu et al., 2019; Deng et al., 2025; Hesselberg et al., 2023; Mgbemena et al., 2019; Park et al., 2010)

The clinical ramifications of these findings are significantly pertinent to primary healthcare services in urban Jakarta. Evidence indicates that handgrip strength could work as an early screening instrument to identify persons at risk of pulmonary function deterioration, especially in healthcare settings with restricted access to spirometry. A study in Japan revealed that every 5-kg improvement in handgrip strength correlated with a 37.9% decrease in the likelihood of pulmonary function abnormalities in younger adults and a 32.7% decrease in older women. The prognostic significance of handgrip strength for pulmonary function impairment is more pronounced in women and those under 60, while the association becomes non-significant in older males after controlling for confounding variables. Moreover, the conjunction of diminished FVC and reduced handgrip strength has been demonstrated to be a robust predictor of significant cardiovascular disease occurrence (hazard ratio = 2.50; 95% CI: 1.43-4.36), suggesting that simultaneous assessment of these two metrics may aid in identifying high-risk populations that could benefit from extensive interventions, encompassing physical activity, nutritional enhancement, and mitigation of pollution exposure. In Jakarta's public health programs, incorporating handgrip strength assessment into community screening initiatives could yield concurrent preliminary data on respiratory and musculoskeletal health, essential for devising preventive strategies against cardiometabolic and respiratory diseases in a swiftly aging urban demographic.(Deng et al., 2025; H. I. Jung et al., 2024; Liu et al., 2022; Mgbemena et al., 2019; Petraglia et al., 2025; Soares et al., 2023)

The strengths of this study reside in the utilization of pulmonary function parameters represented as percentage of predicted values, adjusted for age, sex, and height, enabling the observed correlations with handgrip strength to more precisely reflect intrinsic functional relationships rather than solely the impact of body size. The intricate urban environment of Jakarta—marked by significant air pollution, dense population, socioeconomic diversity, and varied lifestyle patterns—enhances external validity, as research on the correlation between handgrip strength and pulmonary function in such contexts is notably limited in the global literature. The extensive age range of individuals (18–96 years) facilitates the analysis of this association throughout several life phases. Nonetheless, some limits must be recognized. The cross-sectional design restricts causal inference concerning whether reductions in handgrip strength occur before to pulmonary function degradation, the reverse, or if both are concurrent signs of aging and systemic inflammation. Secondly, potential confounding variables—including daily physical activity, specific nutritional status (protein and micronutrient intake), smoking history (active, passive, or nonsmoker), occupational exposures (dust and chemicals), and individual exposure levels to air pollution in Jakarta (PM2.5 and PM10)—were not entirely controlled, and residual confounding cannot be dismissed. Third, if the study sample was limited to specific geographic regions of Jakarta or particular occupational categories (e.g., formal versus informal workers), generalization to the entire urban population of Jakarta should be approached with caution and ideally validated through multicenter longitudinal studies encompassing all five municipalities of Jakarta. Future prospective studies that include sequential evaluations of handgrip strength and pulmonary function, alongside analyses of inflammatory biomarkers (CRP, IL-6, TNF-α), body composition (DXA or bioimpedance), and environmental exposure (personal pollution monitoring), would yield a more thorough comprehension of the causal and temporal pathways governing the muscle–lung axis in urban Indonesian populations.(Deng et al., 2025; H. I. Jung et al., 2024; Liu et al., 2022; Ohara et al., 2020; Petraglia et al., 2025; Zhu et al., 2020).

CONCLUSION

This study shows that handgrip strength is substantially correlated with pulmonary function in the adult population of DKI Jakarta, especially regarding lung capacity measures represented as percentages of expected values. Handgrip strength had a positive correlation with vital capacity (% predicted) and forced vital capacity (% predicted), suggesting that persons with enhanced peripheral muscular strength generally possess higher lung capacity. The FEV_1/FVC ratio (% predicted) exhibited a persistent negative correlation with handgrip strength, indicating that flow ratio metrics do not directly represent muscle strength levels.

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