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The Relationship Between Knowledge and Availability of Personal Protective Equipment with Compliance in Their Use among Household Industry Workers in Palembang: A Cross-Sectional Study

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ABSTRAK

Pekerja industri rumah tangga terpapar berbagai bahaya kerja, tetapi jarang tercakup program keselamatan dan kesehatan kerja (K3). Penelitian ini bertujuan menganalisis hubungan pengetahuan dan ketersediaan alat pelindung diri (APD) dengan kepatuhan penggunaan APD pada pekerja industri rumah tangga di Kelurahan Sukajaya, Kecamatan Sukarami, Palembang. Penelitian analitik dengan desain potong lintang dilaksanakan pada Mei 2026 terhadap 52 pekerja, yaitu seluruh pekerja yang memenuhi kriteria pada unit usaha yang dapat dijangkau. Ketiga variabel diukur dengan kuesioner terstruktur berdasarkan laporan responden; pekerja dikategorikan patuh bila skor kepatuhan ≥8 dari 10. Data dianalisis dengan uji *chi-square* dengan koreksi kontinuitas (α = 0,05), *odds ratio* (OR), dan rasio prevalensi (RP) kasar. Sebanyak 63,5% pekerja tergolong patuh. Pengetahuan baik (p = 0,003; OR = 7,71; IK 95% 2,13–27,89; RP = 2,38) dan ketersediaan APD (p = 0,001; OR = 9,97; IK 95% 2,49–39,88; RP = 2,94) berhubungan dengan kepatuhan pada analisis bivariat. Pengetahuan dan ketersediaan APD berhubungan dengan kepatuhan penggunaan APD pada pekerja yang diteliti. Karena desainnya potong lintang dan faktor perancu belum dikendalikan, temuan ini tidak menunjukkan hubungan sebab akibat. Edukasi K3 dan penyediaan APD yang sesuai dengan bahaya pekerjaan perlu dikembangkan bersama dan dievaluasi lebih lanjut.

Kata kunci : alat pelindung diri; industri rumah tangga; kepatuhan; ketersediaan; pengetahuan

ABSTRACT

Home-based industry workers are exposed to various occupational hazards but are rarely covered by occupational safety and health (OSH) programmes. This study aimed to analyse the association of knowledge and availability of personal protective equipment (PPE) with PPE compliance among home-based industry workers in Sukajaya Village, Sukarami District, Palembang. An analytical cross-sectional study was conducted in May 2026 among 52 workers, comprising all eligible workers in the enterprises that could be reached. All three variables were measured with a structured, self-reported questionnaire; workers were classified as compliant if their compliance score was ≥8 out of 10. Data were analysed using the continuity-corrected chi-square test (α = 0.05), crude odds ratios (OR), and crude prevalence ratios (PR). Overall, 63.5% of workers were classified as compliant. Good knowledge (p = 0.003; OR = 7.71; 95% CI 2.13–27.89; PR = 2.38) and PPE availability (p = 0.001; OR = 9.97; 95% CI 2.49–39.88; PR = 2.94) were associated with compliance in bivariate analysis. Knowledge and PPE availability were associated with PPE compliance among the workers studied. Because the design was cross-sectional and confounders were not controlled, these findings do not indicate a causal relationship. OSH education and the provision of PPE appropriate to work hazards should be developed together and evaluated further.

Key words: *availability; compliance; home-based industry; knowledge; personal protective equipment*

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Introduction

Accidents and occupational diseases remain a global public health burden. A 2023 International Labour Organization (ILO) report, with estimates for 2019, shows that around 2.93 million workers died due to work-related factors and more than 395 million workers suffered non-fatal occupational injuries [1]. Another ILO report published in the same year describing the 2019 situation estimated that about 58% of the world's workforce, or nearly 2 billion people, worked informally [2]. In Indonesia, the proportion of informal workers still reached 57.80% of the total working population as of August 2025 [3]. Many informal sector workers work in hazardous jobs that are not fully regulated by labor regulations, making them vulnerable to exposure to occupational hazards [4].

In this study, home industry is defined as micro or small-scale processing businesses run in the owner's residential environment. The Central Statistics Agency (BPS) classifies manufacturing industries with fewer than 20 workers as micro and small industries [5]. Most such businesses operate informally, but home industries are not always synonymous with informal sectors. Workers can be exposed to sharp objects, heat, dust, chemicals, and non-ergonomic working positions, with different types of hazards depending on the type of business.

In the hierarchy of hazard control, elimination, substitution, and technical control are more effective than administrative control and PPE. PPE is the last layer of protection selected based on hazard and used alongside other appropriate controls, such as ventilation repairs or equipment securing [6]. National regulations require employers to provide PPE that meets standards free of charge to workers [7]. However, a literature review of informal sector workers in Indonesia shows that compliance with PPE usage is still low and related to workers' knowledge and attitudes [4], PPE availability, and support for OSH socialization [8].

This study uses the PRECEDE–PROCEED model as the conceptual framework. This model views health behavior as influenced by predisposing factors (such as knowledge, attitude, and perception), enabling factors (such as availability and affordability of facilities), as well as reinforcing factors (such as supervision and social support) [9]. Knowledge about the function and types of PPE as well as the risks of working without PPE are placed as predisposing factors, while the presence, suitability, adequacy, ease of accessibility, and feasibility of PPE are placed as enabling factors. These two groups of factors form the basis for developing the research instrument indicators.

Research on *art glass* workers in Gresik found a relationship between knowledge and PPE availability with compliance with PPE use [10]. Good knowledge is not always accompanied by safe behavior; at a tofu factory in Serang Regency, not one out of 40 workers used PPE fully [11]. Among port workers in Makassar, PPE availability did not show a significant relationship with compliance, whereas knowledge was related [12]. These studies were conducted on one type of business or one company. Evidence from various types of household industries within one area, where PPE provision depends on business owners and where PPE needs differ between tasks, is still limited. This study provides preliminary evidence from this context while also showing the consequences of task diversity on compliance measurement.

Sukajaya Subdistrict, Sukarami District, Palembang, has a variety of home industries, including food processing, garment manufacturing, furniture, and simple welding. Local comparative data on PPE usage in these businesses is not yet available. This study aims to analyze the relationship between knowledge and availability of PPE with PPE usage compliance among home industry workers in Sukajaya Subdistrict.

Method

Design, location, and research time

This study is an analytical observational quantitative study with a *cross-sectional* design reported referring to the STROBE guidelines [13]. Data collection was conducted in May 2026 at a home industry in

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Sukajaya Village, Sukarami District, Palembang City, South Sumatra. Knowledge, availability of PPE, and compliance were measured in one questionnaire for each respondent, so the time sequence between variables could not be determined.

Population and sample

The accessible population consists of workers in home industry units in Sukajaya Subdistrict who the researcher can reach during the data collection period. All workers who meet the inclusion criteria, namely actively working, present at the data collection site, and willing to be respondents, were included in the study (total sampling of the affordable population). Workers who are on leave or not at work during the study period were excluded. The number of respondents analyzed was 52 people from five business groups, namely food processing, garment, furniture, welding, and other businesses outside these four groups. Because absent workers were not included, the study results only describe the covered workers and are not intended to be generalized to all home industries in Sukajaya Subdistrict.

Variables and instruments

Data were collected using a structured questionnaire that had been tested for validity and reliability before use. Observations of workplace conditions were conducted as supporting information, while all research variables were categorized based on questionnaire answers. Knowledge about PPE was measured with 10 true–false statements regarding the function, type, and risks of working without PPE (true = 1, false = 0; score range 0–10). Knowledge was categorized as good if the score was ≥8 (≥75%) and poor if the score was ≤7.

PPE availability is measured by 5 yes–no questions regarding the availability of PPE, suitability of PPE type with occupation, adequacy of quantity, ease of accessibility, and usability. PPE is categorized as available if there are at least 3 "yes" answers. This index describes combined access to PPE and is assessed at the worker level based on respondent reports. The available category does not require all aspects to be met, so it does not always mean PPE is simultaneously available, feasible, and sufficient.

Compliance with PPE use was measured by 5 statements on a scale of always (2), sometimes (1), and never (0), covering PPE use since starting work, PPE suitability with the type of job, use during short jobs, use even uncomfortable, and not working before PPE was available (score range 0–10). Respondents were categorized as compliant if the score was ≥8 (≥75%). The compliance category can be achieved without answering "always" on all items, so it is not identical to complete, correct, and consistent PPE use across all tasks. The item "did not work before PPE is available" has a content close relationship with the PPE availability variable; the consequences are discussed in the limitation section. The category limits for the three variables were set by the researcher and are not standard cutoff points. PPE needs were not determined through hazard assessments per task; the suitability of PPE type with occupation was assessed based on respondents' answers.

Ethical considerations

Participation in the study was voluntary. Each worker received an explanation about the research objectives and expressed willingness to be a respondent before filling out the questionnaire.

Data analysis

Data were processed using SPSS version 26. Univariate analysis was used to describe respondent characteristics and the distribution of each variable. Bivariate analysis used the *chi-square test* with continuity correction (Yates) at a significance level of $\alpha = 0.05$. The lowest expected frequency in both tables 2 × 2 was 6.58 and 5.48, so no cells had an expected frequency less than 5. The strength of the relationship is expressed by *the rough odds ratio* (OR) for the compliance category along with a 95% confidence interval (CI) using the Wald method. Because compliance is a frequently found outcome (63.5%), OR tends to appear higher than the prevalence ratio; therefore, a crude prevalence ratio (RP) along with a 95% CI was also reported [14]. Categories of insufficient knowledge and unavailable PPE

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were used as references, and the percentage of compliance was calculated per row. No data were lost in the variables analyzed (n = 52). Multivariate analysis was not conducted because the number of non-compliant workers was limited (19 people) and grouping workers within the same business unit was not taken into account in the analysis; therefore, the analysis was exploratory and the reported estimates were roughly correlated.

Results and Discussion

Respondent characteristics and univariate analysis

The characteristics of respondents and the distribution of research variables are presented in Table 1. The largest age group was 26–35 years (34.6%), most respondents were female (59.6%), half of respondents had a high school/vocational school education (50.0%), and the largest group had 5–10 years of service (42.3%). The most common type of business was food processing (38.5%), followed by garment manufacturing (23.1%). As many as 65.4% of respondents had good knowledge of PPE, 71.2% stated that PPE is available in the workplace, and 33 out of 52 respondents (63.5%) were considered compliant in using PPE.

Table 1. Characteristics of Respondents and Distribution of Research Variables (n = 52)

Variable	n	%
Age (years)		
18–25	11	21,2
26–35	18	34,6
36–45	15	28,8
>45	8	15,4
Gender		
Male	21	40,4
Women	31	59,6
Education		
SD	7	13,5
SMP	13	25,0
Senior High School/Vocational School	26	50,0
College	6	11,5
Length of service		
<5 years	16	30,8
5–10 years	22	42,3
>10 years	14	26,9
Type of business		
Food processing	20	38,5
Convection	12	23,1
Furniture	8	15,4
Classification	6	11,5
Others	6	11,5
Knowledge about PPE		
Good	34	65,4
Less	18	34,6
PPE Availability		
Available	37	71,2
Not available	15	28,8
PPE usage compliance		
Obedient	33	63,5
Non-compliant	19	36,5

Source: Primary data, 2026. Each variable consisted of 52 respondents (100.0%). Age and length of service categories followed the questionnaire categories; "others" refers to business types outside the four groups mentioned.

Bivariate analysis

Bivariate analysis results are presented in Table 2. The proportion of compliant workers was higher among well-informed workers compared to those with poor knowledge (79.4% vs 33.3%) and among workers who stated PPE was available compared to those who stated not available (78.4% vs 26.7%). The compliance odds for well-informed workers were 7.71 times that for poor-knowledge workers, while the prevalence of compliance was 2.38 times higher. The compliance odds for workers who stated PPE was available was 9.97 times odds for workers who stated PPE was not available, with a compliance prevalence 2.94 times higher. The confidence intervals for both estimates were wide and overlapping. As many as 8 out of 37 workers (21.6%) who stated PPE was available remained non-compliant, while 4 out of 15 workers (26.7%) in the non-PPE group were considered compliant.

Table 2. The Relationship Between Knowledge and Availability of PPE with Compliance in PPE Use (n = 52)

Variable / category	Compliance n (%)	Non-compliant n (%)	p
Knowledge			0,003

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Variable / category	Compliance n (%)	Non-compliant n (%)	p
Good (n = 34)	27 (79,4)	7 (20,6)	
Less (n = 18)[a]	6 (33,3)	12 (66,7)	
χ^2 = 8,88; OR = 7.71 (IQ 95% 2.13–27.89); RP = 2.38 (IQ 95% 1.21–4.68)			
PPE Availability			0,001
Available (n = 37)	29 (78,4)	8 (21,6)	
Not available (n = 15)[a]	4 (26,7)	11 (73,3)	
χ^2 = 10,18; OR = 9.97 (IQ 95% 2.49–39.88); RP = 2.94 (IQ 95% 1.25–6.92)			

Source: Primary data, 2026. Percentages are calculated per row. χ^2 = *chi-square* with continuity correction; OR = rough *odds ratio* for the compliance category (95% CI Wald method); RP = crude prevalence ratio for the compliance category; CI = confidence interval; [a] reference category.

The relationship between knowledge and compliance with PPE use

Well-informed workers had a compliance odds of 7.71 times and a compliance prevalence of 2.38 times compared to poor-informed workers. This direction of relationship aligns with research on *art glass workers* in Gresik [10], wood production workers in Palembang [15], chemical industry workers [16], as well as a literature review in the informal sector in Indonesia [4,8]. This comparison is limited to the direction of the relationship, not the magnitude of the effect, because the definitions of compliance, instruments, task types, and design differ between studies. Within the PRECEDE–PROCEED framework, knowledge about the function of PPE and the risk of working without protection are predisposing factors that can shape risk awareness [9]. Research on informal automotive craftsmen in Nigeria shows that perception of occupational risk is positively related to PPE use [17]; These findings support this conceptual mechanism but are not direct replication because the variable measured is risk perception, not knowledge. This mechanism cannot be proven by the data in this study. Formal education or OHS training can also be related to both knowledge and compliance, so some of the observed relationships may be influenced by these factors.

Knowledge does not guarantee compliance. As many as 7 out of 34 well-informed workers (20.6%) remained non-compliant. A gap between knowledge and actions was also reported at tofu factories in Serang Regency [11], although the definition of complete PPE use in the study did not match the compliance category in this study. Reasons for non-compliance were not measured in this study. The most recent systematic review and meta-analysis reported that the most common barriers to PPE use were the unavailability of PPE, followed by the desire to save time, lack of training, and discomfort [18]. Therefore, OHS education for home industry workers should not only be informative but also discuss these practical barriers and include demonstrations of PPE use in the workplace; the effectiveness of this approach needs to be tested in intervention research.

The relationship between PPE availability and compliance with PPE usage

PPE availability is related to compliance: 78.4% of workers who stated PPE availability were considered compliant, while nearly three-quarters of workers who stated PPE was not available. These findings align with the concept of enabling factors, namely behavior that is difficult to realize if necessary facilities are inaccessible [9], and with research on *art glass workers* in Gresik [10]. However, 8 out of 37 workers who stated PPE was available remained non-compliant, so the availability of facilities alone does not explain all behaviors. The presence of 4 compliant workers in the group where PPE is not available also shows that the availability category is a composite index of five aspects, not merely the physical presence of PPE; this pattern needs to be further examined based on item answers. Furthermore, the content closeness between the compliance item "does not work before PPE is available" and the availability variable can amplify the observed relationship.

The OR estimate point for PPE availability is greater than the OR for knowledge, but both estimates are still rough, have broad IKs, and overlapping IKs. Therefore, this study cannot conclude that one factor is stronger than the other. Determining the dominant factor requires

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analysis with adequate adjustments to the larger sample.

Different results were reported among workers at PT Pelabuhan Indonesia Regional 4 Makassar, where PPE availability was not significantly related to compliance (p = 0.304), while knowledge was related [12]. The absence of a significant relationship in these studies did not prove that availability did not play a role, and significant differences between studies did not necessarily indicate differences in the magnitude of the relationship. These differences may be related to sample size, variable definitions, and analysis methods. As an explanatory hypothesis, more uniform provision of PPE in formal companies can narrow availability variations, whereas in home industries, PPE provision depends on the ability and awareness of business owners; this hypothesis has not been tested in this study.

Implications for OHS programs in home industries

These findings support the need for an approach that combines worker education with the fulfillment of PPE by business owners, although the effectiveness of both approaches was not tested in this study. The selection of PPE needs to be based on hazard assessment of each task, compatibility with users, and training on proper usage methods, accompanied by proper work environment control, such as ventilation and equipment safety [6]. Occupational Health Effort Posts (Pos UKK) are community-based health efforts for informal sector workers [19], thus serving as one of the facilities for OHS guidance in home industries. Its utilization requires mapping the availability of services, worker needs, and coordination with business owners.

Research limitations

This study has several limitations. First, the cross-sectional design cannot indicate whether knowledge or availability of PPE precedes compliance. Second, all three variables are measured based on respondent reports without explicitly defined memory periods, thus potentially containing social *desirability bias* and memory bias. Third, category boundaries are set by the researcher, the availability index is combined, and one compliance item intersects with the availability variable; sensitivity analysis without these items has not been conducted. Fourth, respondents are limited to workers present in accessible business units, which can lead to selection bias. Fifth, workers in the same business unit may have similar PPE and supervision conditions; this grouping is not taken into account, so the IK and p-value may appear narrower or smaller than they should be. Sixth, the analysis is still bivariate and does not yet control for confounding factors such as business type, education, OHS training, attitude, PPE comfort, and business owner supervision. Seventh, PPE needs differ between business types, so the meaning of compliance categories can differ between business groups. The magnitude and direction of bias due to these limitations cannot be determined from the available data, and these findings only apply to 52 workers studied.

Conclusion

Among 52 home industry workers studied in Sukajaya Subdistrict, Palembang, 63.5% were classified as compliant with using PPE. Good knowledge and availability of PPE were related to compliance with PPE use in bivariate analysis. The interpretation of findings was limited by respondent-report-based measurements, cross-sectional design, and uncontrolled confounding factors.

Home industry owners are advised to select and provide PPE based on hazard assessments for each task, in sufficient quantities and in suitable condition, as well as to regularly inspect and replace damaged PPE. Community Health Centers and the Palembang City Health Office can consider OHS guidance for home industries through counseling, demonstration of PPE use, and regular monitoring, for example through Pos UKK, after mapping needs and coordinating with business owners; the scope of training and use of PPE according to the task can be an evaluation indicator. Related agencies can explore support for providing PPE provision for micro businesses by considering the suitability of protection against hazards and

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maintenance capability, not just price. Further research is recommended to improve measurement validity by defining compliance per task and repeated observation, adequately planning the number of workers and business units, considering grouping per business unit, and using longitudinal designs or intervention evaluations to assess behavioral changes due to education or provision of PPE.

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