

ORIGINAL RESEARCH ARTICLE

Strengthening reproductive health among female workers through the Gerakan Pekerja Perempuan Sehat Produktif program: Application of the continuous health examination network model in Indonesia

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Abstract

The expansion of women in employment warrants more focus on reproductive health and occupational well-being. In Indonesia, the Gerakan Pekerja Perempuan Sehat Produktif (GP2SP) program has been developed to promote the health of female workers. However, the implementation of the program is still limited due to the absence of an integrated operational structure. This research is intended to create a Continuous Health Examination Network (CHEN) model in an effort to improve women's reproductive health by revitalising the GP2SP program. While traditional workplace interventions focus on episodic services, the CHEN model incorporates ongoing monitoring, engagement with many stakeholders and promotive, preventive, curative and rehabilitative approaches. The model is useful for low- and middle-income nations, especially African settings, where workplace reproductive health services are generally fragmented. This study used a research and development design based on the ADDIE model. The investigation was cross-sectional and included 104 married female workers from two companies in Riau Province, Indonesia. Data were acquired through structured questionnaires and analyzed using descriptive statistics and chi-square testing. Model development consisted of needs assessment, model drafting, and expert validation through a two-round Delphi technique. Workers' attitudes were substantially related to program knowledge ($p = 0.027$). The CHEN model proved viable and may be useful for enhancing women's reproductive health and productivity in office settings. (*Afr J Reprod Health* 2026; 30 [15]:80-92).

Keywords: Reproductive Health, Female Workers, Women's Health

Résumé

L'augmentation de la participation des femmes au marché du travail nécessite une attention accrue à la santé reproductive et au bien-être au travail. En Indonésie, le programme *Gerakan Pekerja Perempuan Sehat Produktif* (GP2SP) a été développé afin de promouvoir la santé des travailleuses. Cependant, sa mise en œuvre demeure limitée en raison de l'absence d'une structure opérationnelle intégrée. Cette recherche vise à développer un modèle de Continuous Health Examination Network (CHEN) afin d'améliorer la santé reproductive des femmes par la revitalisation du programme GP2SP. Alors que les interventions traditionnelles en milieu professionnel reposent principalement sur des services ponctuels, le modèle CHEN intègre un suivi continu, l'implication de multiples parties prenantes ainsi que des approches promotionnelles, préventives, curatives et de réadaptation. Ce modèle présente un intérêt particulier pour les pays à revenu faible et intermédiaire, notamment dans les contextes africains où les services de santé reproductive en entreprise sont souvent fragmentés. Cette étude a adopté une méthodologie de recherche et développement fondée sur le modèle ADDIE. L'enquête, de nature transversale, a impliqué 104 travailleuses mariées issues de deux entreprises de la province de Riau, en Indonésie. Les données ont été recueillies à l'aide de questionnaires structurés et analysées par des statistiques descriptives ainsi que par le test du chi carré. Le développement du modèle comprenait une évaluation des besoins, l'élaboration du modèle et une validation par des experts à travers une technique Delphi en deux cycles. Les attitudes des travailleuses étaient significativement associées à leur niveau de connaissance du programme ($p = 0,027$). Le modèle CHEN s'est révélé réalisable et pourrait contribuer à l'amélioration de la santé reproductive et de la productivité des femmes en milieu professionnel. (*Afr J Reprod Health* 2026; 30 [15]: 80-92).

Mots-clés: Santé reproductive, travailleuses, santé des femmes.

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Introduction

In an effort to support the success of national development and the achievement of the globally agreed-upon Sustainable Development Goals (SDGs), the government and the business sector are expected to continuously improve productivity through various strategies focused on enhancing welfare and competitiveness in the era of globalization, including through the protection of workers' health.¹ Women's participation in the workforce continues to increase year by year, yet attention to the health protection of female workers remains suboptimal. In fact, female workers play a strategic role in development, both as productive individuals in the workplace and as managers of family health at home.²

As subjects in health development, female workers play a role in fulfilling their family's food needs, shaping household consumption patterns, and serving as educators and caregivers within the family.³ However, as objects of health development, they also face various vulnerabilities such as the potential for exploitation, the double burden of balancing work and family responsibilities, and exposure to hazards in the workplace. In addition, women experience unique biological stages, such as menstruation, pregnancy, childbirth, the postpartum period, and breastfeeding, which require more comprehensive health protection.⁴

Despite these advancements, women continue to experience a range of intricate health challenges. Globally, these challenges are frequently associated with elevated maternal mortality rates, sexually transmitted infections, cancer, communicable and non-communicable diseases, as well as various obstetric and gynecological issues, such as postpartum hemorrhage.⁵ In Indonesia, women's health concerns serve as critical indicators of the national health status. Notable issues include reproductive health, evidenced by the high maternal mortality rate (MMR), insufficient exclusive breastfeeding coverage, nutritional deficiencies such as anemia and protein energy malnutrition (PEM), a rise in both communicable and non-communicable diseases, and mental health disorders.^{6,7} The workplace is one of the key environments for

implementing health promotion efforts. A healthy and conducive work environment can play an important role in supporting employee well-being, health behaviors, and productivity. Recent studies have shown that the quality of the work environment and the implementation of workplace health programs contribute to improved job satisfaction, physical and mental health, as well as overall employee performance.^{8,9}

Therefore, providing health facilities and service programs in the workplace is an important step that companies must undertake. These efforts not only make it easier for workers to access health services but also reflect the company's commitment and responsibility to protect and improve the well-being of its workforce.¹⁰ This is increasingly important for female workers who have certain health vulnerabilities and face the dual roles of work and family life. Additionally, addressing these health vulnerabilities is essential for enhancing productivity and reducing absenteeism, particularly among women who often juggle multiple responsibilities.¹¹

Various countries have developed efforts to improve workers' health through workplace health promotion programs as an initial step in addressing various workforce health issues, including those affecting female workers. Studies on developing countries demonstrate that female workers still encounter serious reproductive health hazards due to poor health protection mechanisms at their workplaces. In South Africa, female informal workers exposed to occupational pollutants are at an elevated risk of unfavorable reproductive outcomes, including low birth weight and pregnancy difficulties, underscoring the inadequate provision of workplace reproductive health treatments in low-resource settings.¹² Likewise, a scoping analysis of the oil, gas, and mining sectors found that female workers in poor areas often suffer from menstruation issues, unsafe pregnancies, and other reproductive health problems as a result of chemical, physical, and emotional dangers in the workplace.¹³ The findings show that occupational reproductive health programmes in many low- and middle-income countries remain fragmented and focus mostly on curative treatments instead of an integrated preventive approach.¹² Similar concerns have been discovered in several Asian developing

countries. Research with migrant female manufacturing workers in Malaysia showed that excessive working hours, lack of organisational support and weak workplace health policies often made it difficult to receive reproductive health care.¹⁴ Pregnancy disorders related with occupational hazards as vibration, irritants, and repetitive job activities were observed among female industrial workers in Indonesia.¹⁵ Healthy workplace programs generally include a range of preventive interventions, such as preventing substance abuse, reducing alcohol consumption, restricting the misuse of illegal drugs or prescription medications, and encouraging the adoption of healthy lifestyles among adult workers.¹⁶

In Indonesia, similar efforts have also been carried out through government policies, such as the Gerakan Pekerja Perempuan Sehat Produktif (GP2SP), or the Movement for Healthy and Productive Female Workers, which aims to improve the health status of female workers. This program covers various aspects, ranging from policies and strategies, advocacy and socialization, program organization, coordination and cooperation, activity implementation, to guidance, monitoring, and evaluation.¹⁷ The implementation of GP2SP is also targeted at addressing women's health issues in the workplace, such as providing reproductive health services for pregnant workers, early detection of non-communicable diseases, fulfilling the nutritional needs of pregnant and breastfeeding workers, increasing breastfeeding during working hours, as well as controlling risk factors in the work environment.

In Pekanbaru, the number of female workers is 195,612 out of a total workforce of 507,617 men and women, indicating that approximately 30% of the workforce is female.¹⁸ In addition, the majority of female workers are in the productive age group, namely, 19–59 years old⁶. Along with the increasing population of female workers, the risk of various health problems, as previously described, also tends to increase.¹⁹ Therefore, this situation requires serious attention in efforts to protect female workers, not only for the individuals themselves and their families but also through tangible support from companies and the active role of the government.

Although the government has initiated the Healthy and Productive Female Workers Movement (GP2SP) program to improve the health and productivity of female workers, the implementation of this program at the workplace level is still not optimal. In many companies, the execution of GP2SP is limited to advocacy and outreach activities by the health department, without being followed by the application of an integrated occupational health system. Data from the Ministry of Health of the Republic of Indonesia in 2023 show that only 48 companies have implemented the program, and only a small number have received the Mitra Bhakti Husada award for its implementation.²⁰ This situation indicates a gap between national policy and implementation at the company level, which is suspected to be due to the absence of a comprehensive operational model as a guideline for systematically and sustainably implementing women workers' health programs.

This study addresses existing gaps by transforming the GP2SP framework into the Continuous Health Examination Network (CHEN) model. This innovative approach integrates biopsychosocial and environmental dimensions into a sustainable occupational health system. The CHEN model employs a comprehensive prevention principle encompassing health promotion, specific protection against occupational risks, early detection and prompt treatment, disability limitation, and rehabilitation within a collaborative network involving female workers, families, colleagues, companies, healthcare facilities, and the government.

Additionally, this model is designed with reciprocal support mechanisms through both bottom-up and top-down approaches, and is thus anticipated to enhance the implementation of women workers' health programs while also increasing their awareness and participation in managing health in the workplace.

Methods

Study design

The research adopted a research and development (R&D) strategy with the ADDIE model designed by Robert Maribe Branch, which consists of five steps: analysis, design, development, implementation, and

evaluation. The present study focused on the stages of analysis, design, and development, with the main objective of developing and validating the Continuous Health Examination Network (CHEN) model as an innovative approach to improve women's occupational and reproductive health through the reactivation of the Gerakan Pekerja Perempuan Sehat Produktif (GP2SP) program. This article does not report the implementation and assessment phases of the CHEN model, as these are the next phases of the larger doctoral research project of field deployment and efficacy testing of the CHEN model in workplace settings. Hence, this study describes the preliminary development phase, focusing on needs assessment, model construction, and expert validation before wide-scale deployment.

The analytical phase used a quantitative cross-sectional approach to measure female workers' knowledge and attitudes towards the GP2SP program. Data were collected using structured questionnaires from qualified respondents from two enterprises in Riau Province, Indonesia. The findings of the analytical phase were used to identify implementation gaps and construct the CHEN model. The processes of the design and development were oriented toward the construction of the CHEN model in various stages: needs assessment, model drafting, expert validation through the Delphi technique, model revision, and final formulation of the model.

Study setting

The study was conducted in two companies, Company X and Company Y, located in Riau Province, Indonesia. These companies were selected due to the relatively large number of female workers and the potential implementation of occupational health programs targeting women workers. Data collection was carried out between March and May 2024.

Study participants and sampling

The study population consisted of all married female workers employed in the two companies. The minimum sample size was calculated using the Lemeshow formula for large populations, assuming a 95% confidence level, a maximum population proportion (P) of 0.5, and an absolute precision (d)

of 0.1. The calculation yielded a minimum sample size of 97 respondents. To account for potential non-response, the sample size was adjusted, resulting in a total sample of 104 respondents included in this study. Participants were selected using proportional random sampling, where the number of respondents from each company was determined proportionally according to the number of female workers.

The inclusion criteria were married female workers who agreed to participate in the study. The exclusion criteria included female workers who did not yet have children and those who declined participation.

Data collection procedures

Phase 1: Analysis

The analysis phase aimed to analyze the knowledge and attitudes of female workers towards the GP2SP program. Data were obtained using a standardized questionnaire designed by the researchers based on theoretical indicators connected to women's occupational and reproductive health programs. The questionnaire comprised two dimensions: knowledge of the GP2SP program and attitudes towards women's occupational health. All items were measured on a 5-point Likert scale ranging from strongly disagree to strongly agree. The questionnaire was pre-tested among 30 female workers who were not part of the study sample before the main study.

Validity assessment was done by utilizing Pearson Product Moment correlation test, all items showed correlation coefficient greater than the crucial value ($r = 0.361$) at 5% level of significance, showing good validity. Reliability testing was performed using Cronbach's alpha, and the instrument showed acceptable internal consistency, with alpha coefficients greater than 0.70. Phase 1 findings were used to identify deficiencies in the GP2SP program implementation and to inform the development of the CHEN model.

Design and development of the CHEN model

The second phase included the design and development of the Continuous Health Examination Network (CHEN) model as an

innovative approach to improve the implementation of the GP2SP. The development process was divided into five stages.

Recognition of possible problems and needs

This phase targeted the identification of gaps and needs in the implementation of the GP2SP program. The data sources included outcomes from Phase 1 and a literature evaluation of occupational and reproductive health programs for female workers.

Development of the model

Based on these highlighted demands, the researchers built a preliminary draft of the CHEN model to illustrate the interactions among stakeholders within the women's occupational health system. The model includes numerous actors, such as government organizations, enterprises, health service units, female workers, co-workers, and family members.

Validation by experts

Expert validation was conducted using a two-round Delphi technique with experts in public health, occupational health, reproductive health, and health policy. Experts were selected by purposeful sampling according to their academic and professional experience in occupational and women's health programs.

In the first round of Delphi, experts evaluated the basic model using a structured assessment instrument and provided feedback on the content feasibility, language clarity, presentation structure, and graphical design. Subsequently, professional recommendations led to the revision of these models. The second Delphi round aimed to reach a consensus on the feasibility and appropriateness of the updated model. Consensus was reached when at least 80% agreement was established across the evaluation domains.

Model updating

The expert review process enhanced the conceptual framework, clarity, and operational procedures of the CHEN model.

Development of the final model

The final phase involved developing the final version of the CHEN model after applying all the experts' advice. The field deployment and testing of the effectiveness of the model were outside the scope of the present study and will be part of upcoming research phases.

Statistical analysis

Statistical analyses were performed using IBM SPSS v26. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to characterize the respondents and replies to the questionnaire in Phase 1. Chi-square test was used for bivariate analysis to find out the connection between independent and dependent variables. Statistical significance was set at $p < 0.05$. Model feasibility in Phase 2 was descriptively examined based on % agreement scores from expert ratings of four assessment categories: content feasibility, language clarity, presentation structure, and graphical design. Feasibility ratings were assessed against the pre-specified criteria. Percentage ratings of 81.25-100 were considered highly viable, 62.50-81.25 as feasible, 43.75-62.50 as less feasible and 25-43.75 as not feasible. Model feasibility was considered acceptable when the average feasibility score achieved at least 81.25% in all evaluation domains.

Ethical considerations

This study received ethical approval from the Research Ethics Committee of the Faculty of Medicine, Universitas Andalas (No: 756/UN.16.2/KEP-FK/2025). All participants were informed about the study objectives and procedures, and written informed consent was obtained prior to data collection. Participation was voluntary, and confidentiality and anonymity of respondents were strictly maintained throughout the research process.

Results

Univariate analysis

Respondent characteristics

Based on the data obtained in the conducted research, the respondents' characteristics are described as shown in Table 1.

Based on the characteristics of the respondents, most female workers were in the 31–35 age group, totaling 44 people (42.3%), indicating that the majority of respondents were of a productive age, with relatively optimal physical and mental conditions, as well as sufficient work experience to understand company policies, including the Healthy and Productive Female Workers Movement (GP2SP) program. In terms of education, most respondents were high school graduates, totaling 48 people (46.2%), followed by junior high school graduates, totaling 26 people (25%), which indicates that the respondents' level of education was adequate to understand information related to occupational health and the implementation of health programs in the workplace.

Meanwhile, based on years of service, most respondents had worked for 11–15 years, totaling 45 people (43.3%), showing that they had extensive work experience and therefore better understood company policies and activities, including worker health programs. Overall, these respondent characteristics indicate a sufficiently supportive condition for increasing knowledge and fostering a positive attitude among female workers towards the implementation of GP2SP in the workplace.

Female workers' attitudes toward understanding the GP2SP program

The results show that respondents generally demonstrated positive attitudes toward the GP2SP program, although the level varied across aspects (Figure 1). The lowest score was found in the awareness aspect (3.70), indicating that respondents' initial awareness of GP2SP as a government program remained limited. The responsive aspect (3.94) suggests that respondents were generally open and willing to respond to policies or directions related to GP2SP, reflecting passive readiness rather than a strong internal initiative. The highest scores were observed for valuing (4.01) and consistency (4.03), showing that

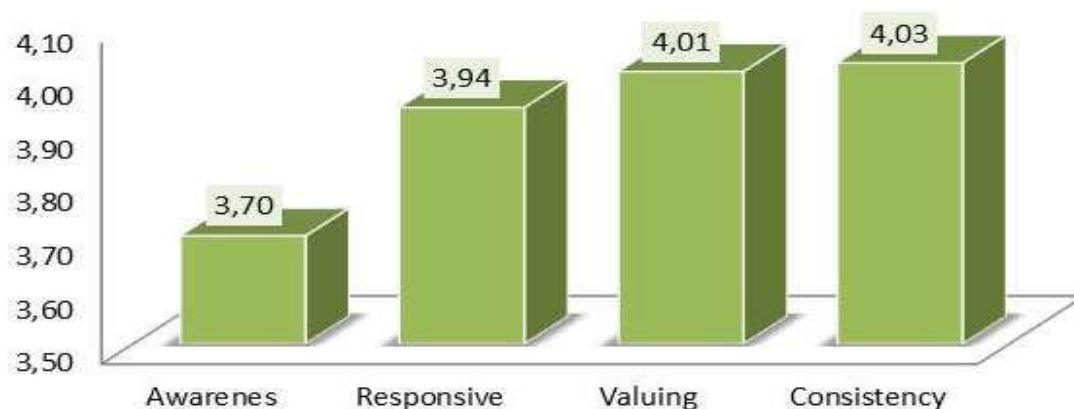
Table 1: Respondent characteristics

Characteristics	Frequency (F)	Percentage (%)
Age		
25–30 years	11	10.6
31–35 years	44	42.3
36–40 years	32	30.8
> 41 years	17	16.3
Education Level		
Primary School	18	17.3
Junior High School	26	25
Senior High School	48	46.2
Higher Education	12	11.5
Length of Employment		
5–10 years	14	13.5
11–15 years	45	43.3
16–20 years	30	28.8
> 21 years	15	14.4

respondents considered women workers' health programs important and consistently supported occupational health efforts in general. However, this positive attitude was more reflected in general workplace health practices rather than in the specific implementation of GP2SP, as illustrated in Graph 1. Female workers' attitudes toward understanding the GP2SP program are an important factor in determining the program's successful implementation in the workplace. Positive attitudes, such as awareness of the importance of maintaining health, concern for occupational safety, and active participation in GP2SP activities, can optimally support the achievement of the program's objectives. In contrast, indifferent attitudes or low participation may hinder the creation of a healthy and productive work environment for female workers.

Bivariate analysis

The results of the Chi-square analysis examining the relationship between attitudes and the Healthy



Graph 1: Proportion of female workers' attitudes in understanding the GP2SP program

Table 2: Chi-square analysis 2. The relationship between attitudes and the healthy and productive women workers movement

GP2SP Understanding	High Attitude F (%)	Low Attitude F (%)	Total F (%)	P-value
Understand	7 (46.7)	8 (53.3)	15 (14.4)	0.027
Do Not Understand	42 (47.2)	47 (52.8)	89 (85.6)	
Total	49 (47.1)	55 (52.9)	104 (100)	

and Productive Female Workers Movement (GP2SP) are presented as follows table 2.

Based on the table above, it was found that out of 104 respondents, 89 did not understand GP2SP. Among the 89 respondents, 42 (47.2%) were identified as having a high attitude score. The Asymp. Sig. The (2-tailed) value from the chi-square test was 0.027. Since the Asymp. Sig. The (2-tailed) value of 0.027 was lower than 0.05, H_0 was rejected, and H_a was accepted. Therefore, it can be concluded that there is a significant relationship between attitude and understanding of the GP2SP program among female employees.

This finding indicates that attitude directly influences an individual's behavior in supporting the implementation of the GP2SP program. Female workers with positive attitudes toward occupational health and safety tend to participate more actively in GP2SP activities, such as attending regular health examinations, participating in health education sessions, and utilizing health facilities provided by the company. Positive attitudes also reflect awareness and acceptance of the importance of maintaining personal health, which is the core objective of the GP2SP Program.

Research results phase II (design and development)

Phase II is the development stage, which involves designing the Model as a tool to strengthen the implementation of women's worker health programs. It is developed in both digital and printed document forms, as a prototype shown in Figure 1.

Figure 1 shows the construction of the CHEN (Continuous Health Examination Network) model based on a biopsychosocial and environmental approach, developed to strengthen the health of female workers in the Productive Healthy Female Workers Movement Program (GP2SP). This model places worker health at the center of the system, supported by various interventions, namely health promotion, specific protection, early detection and prompt treatment, and rehabilitation. Its implementation is also supported by a health service system and cross-sectoral collaboration involving the government, companies, families, health workers, and worker representatives. Operationally, the CHEN model functions through coordinated collaboration between companies, healthcare providers,

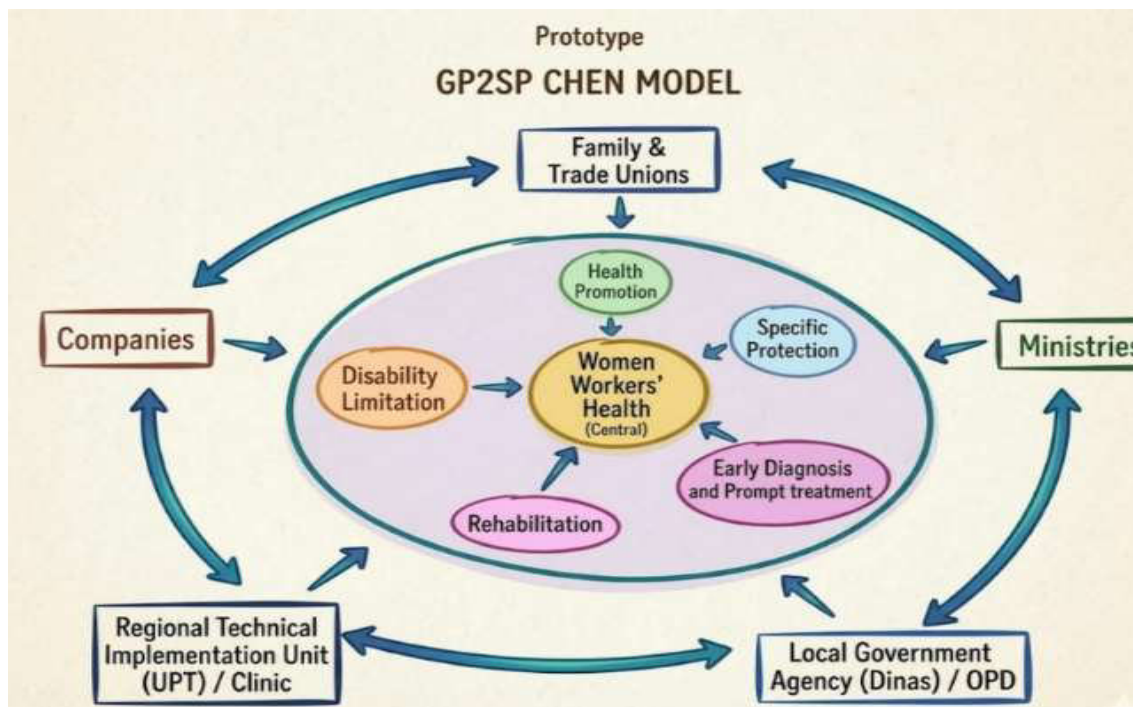


Figure 1: Conceptual framework of the continuous health examination network (CHEN) model for female workers' health

government agencies, workers, and families. Companies are responsible for facilitating occupational health programs, periodic health examinations, and workplace safety policies. Healthcare professionals provide health screening, education, treatment, and rehabilitation services, while government agencies monitor policy implementation and program compliance. Workers actively participate in health promotion activities and periodic examinations, whereas families provide social and emotional support. This collaborative mechanism is expected to create continuous monitoring and improvement of female workers' health in workplace settings.

To guide the future implementation and evaluation of the CHEN model, several proposed indicators were developed, including worker health, health promotion, specific protection, early detection and prompt treatment, rehabilitation, and support-system components. The details of the proposed indicators are presented in Table 3.

After the model was designed, expert validation was conducted to ensure its suitability and feasibility for implementation needs in the field. The validation process used the Delphi

method, a technique for systematically and iteratively gathering expert opinions until consensus was reached. Validation was conducted using a modified instrument and involved seven experts, including occupational health experts, OSH practitioners, academics, social experts, company representatives, and experts from the health department. The model is considered feasible if it obtains an average assessment score of more than 60% for each component, as it can be used to strengthen the health of female workers, the expert validation are presented in Table 4.

Based on the Delphi assessment by seven validators, the CHEN (Continuous Health Examination Network) model obtained an average score of 3.25, indicating that it is feasible for implementation. The model was considered scientifically sound, clearly constructed, and practical for field application. It also offers novelty by integrating promotive and preventive approaches through collaboration among workers, companies, healthcare professionals, and the government. Overall, the CHEN model is regarded as feasible and suitable for improving the health of female workers

Table 3: Indicators of Success for the CHEN Model

Component	Key Indicator	Target	Measurement Method
Worker Health (Core)	Physical, mental, and social health status of workers	≥ 90% healthy workers	Periodic medical check-ups, mental health surveys, absenteeism records
Health Promotion	Participation in OHS education and healthy behavior practices	≥ 80% participation; ≥ 75% healthy behavior	Training reports, questionnaires, field observations
Specific Protection	Compliance with PPE and reduction of workplace risks	≥ 90% PPE compliance; ≥ 20% reduction in accidents	Safety audits, accident reports
Early Diagnosis & Prompt Treatment	Participation in periodic health examinations and response time to health issues	≥ 90% workers examined; ≤ 24 hours response	Health examination records, clinic reports
Disability Limitation & Rehabilitation	Workers returning to work and satisfaction with rehabilitation	≥ 80% return to work; ≥ 85% satisfaction	HR reports, medical records, surveys
Support System	Availability of health facilities and policy implementation	100% facility availability; ≥ 90% policy compliance	Facility evaluation, policy audits

Table 4: Expert validation results

No	Evaluation Indicators	Validators (1–7)	Mean	Category
A. Substance Aspect				
1	The model reflects clear novelty compared to existing models	3, 3, 4, 3, 3, 4, 3	3.29	Feasible
2	The components of the model are relevant to the underlying theory	3, 3, 3, 4, 3, 3, 4	3.29	Feasible
3	The logical flow of the model is scientifically consistent	3, 3, 4, 3, 3, 3, 4	3.29	Feasible
B. Construction Aspect (Visual/Diagram)				
4	Symbols and arrow directions in the flow diagram are easy to understand	3, 3, 3, 3, 4, 3, 3	3.14	Feasible
5	Relationships between variables/stages are presented systematically	3, 4, 3, 3, 3, 3, 4	3.29	Feasible
6	The model visualization does not create ambiguity or multiple interpretations	3, 3, 3, 4, 3, 3, 3	3.14	Feasible
C. Feasibility and Utility Aspect				
7	The model is feasible to be implemented in real field conditions	3, 3, 4, 3, 3, 3, 4	3.29	Feasible
8	The model provides effective solutions to female workers' health problems in the workplace	3, 3, 3, 4, 3, 3, 4	3.29	Feasible
9	The model has flexibility for further development	3, 4, 3, 3, 3, 3, 4	3.29	Feasible
Average			3.25	Feasible

Discussion

The results of the bivariate analysis in this study indicate a significant relationship between workers' attitudes and their understanding of the Productive Healthy Female Workers Movement Program (GP2SP). Female workers with a positive attitude toward occupational health and safety tend to be more active in participating in health promotion activities, such as regular health check-ups, health

education sessions, and the use of health facilities provided by the company.²¹ A positive attitude toward workplace health can increase workers' motivation to engage in various promotional and preventive activities organized by the organization. Previous research has shown that integrating health promotion into the workplace can improve workers' participation and reinforce better health behaviors.²² These findings suggest that strengthening workers' attitudes toward

occupational and reproductive health may improve the effectiveness of workplace-based preventive health systems. In many developing countries, reproductive health services for female workers are often fragmented and limited to curative measures. Therefore, improving awareness and participation through workplace-based health promotion may help bridge the gaps in access to preventive reproductive health services.

The CHEN model aligns with the biopsychosocial approach in occupational health, which emphasizes that workers' health is influenced not only by biological factors but also by psychological, social, and environmental conditions. This approach is particularly relevant for female workers, who often experience dual burdens related to occupational demands and reproductive health responsibilities. In addition to attitude factors, the mental health of female workers is also an important focus in the developed CHEN model. A work environment with high pressure can trigger work-related stress, which leads to decreased performance and an increased risk of mental health disorders.²³ Research has shown that work stress is closely related to reduced productivity and a higher risk of job burnout. Therefore, a work environment that supports a balance between work life and family life becomes a crucial factor in improving workers' psychological well-being. Organizational policies that support work-life balance have been shown to reduce stress levels and enhance employees' emotional well-being.²⁴

The CHEN model underscores the significance of regular health screenings as integral components of workplace disease prevention strategies. Routine assessments, including anemia screening, blood pressure measurement, body mass index evaluation, and reproductive health examinations, facilitate the early identification of health issues frequently encountered by female employees, thereby enhancing treatment efficacy and mitigating long-term complications. Prior research has demonstrated that workplace health promotion and education initiatives can augment participation in health screenings and preventive services, thereby contributing to improved health outcomes and work capacity among employees.²⁵ Furthermore, the incorporation of occupational

safety and health (OSH) programs through educational and safety training endeavors can heighten workers' awareness of occupational hazards and diminish workplace accidents. Furthermore, the incorporation of occupational safety and health (OSH) programs through educational and safety training endeavors can heighten workers' awareness of occupational hazards and diminish workplace accidents. The implementation of comprehensive workplace health programs that amalgamate health promotion and protection has been shown to enhance worker well-being and organizational productivity.²⁶

In addition to implementing occupational health and safety (OHS), the CHEN model also considers the ergonomic aspects of work to prevent musculoskeletal disorders, which are commonly experienced by workers. Musculoskeletal disorders are among the most frequent health problems faced by workers, especially those involved in jobs involving repetitive activities or static working positions for extended periods.²⁷ Ergonomic interventions that include education and improvements to the work environment have been proven to reduce musculoskeletal complaints and increase workplace comfort.²⁸ Research has shown that applying good ergonomic principles can decrease the risk of occupational injuries and improve worker productivity.²⁹

The CHEN model is distinguished by its integration of advanced promotive, preventive, curative, and rehabilitative strategies within a continuous collaborative network comprising enterprises, health professionals, families, workers' representatives, and government agencies. Unlike traditional occupational health programs, which predominantly emphasize workplace safety, the CHEN model specifically addresses female reproductive health and psychological well-being as essential components of occupational health. This comprehensive approach is anticipated to enhance continuity of care and facilitate access to workplace-based reproductive health services for female workers. Previous studies have demonstrated that occupational exposure and inadequate health protection in the workplace can adversely affect the reproductive health of female workers, particularly in physically demanding and informal sectors.¹³ The CHEN model may also

prove beneficial in resource-constrained settings and developing countries, including regions in Africa and Southeast Asia, where occupational and reproductive health services for female workers are limited. In many African nations, particularly within informal and labor-intensive industries, female workers commonly face challenges such as limited access to reproductive health care, occupational hazards, poor working conditions, and a shortage of occupational health specialists.^{12,30} Research conducted in sub-Saharan Africa has identified persistent gaps in sexual and reproductive health services due to insufficient healthcare resources and underdeveloped occupational health systems. Furthermore, it has been reported that female workers in South Africa's informal sectors face reproductive health risks associated with exposure to occupational pollutants. The CHEN model offers a practical framework for enhancing women's occupational and reproductive health services in low- and middle-income countries by emphasizing cross-sectoral collaboration, preventive interventions, periodic health monitoring, and community support.

Limitations

The analysis phase combined quantitative assessment of female workers' knowledge and attitudes with qualitative exploration through structured interviews with company health officers and healthcare providers to identify implementation gaps in the GP2SP program. This study was limited to the design and development stage, and the effectiveness of the CHEN model has not yet been evaluated through field implementation. Future studies are needed to assess the practicality, sustainability, and effectiveness of the model in diverse workplace settings.

Conclusion

The CHEN model offers a new and comprehensive framework to improve women's occupational and reproductive health programs with a combination of promotive, preventive, curative, and rehabilitative approaches, enabled by cross-sectoral collaboration between companies, health care providers, government institutions, worker representatives, and families. The scientific contribution of this

study is the elaboration of a biopsychosocial and environmental occupational health model with a special focus on female reproductive health and psychosocial well-being, which are commonly underrepresented in standard workplace health programmes. The CHEN model has practical implications for improving the accessibility of reproductive healthcare in the workplace, early disease identification, occupational health monitoring, and the health and productivity of female workers. Additionally, the approach can provide an operational framework for resource-poor settings and developing countries where occupational and reproductive health care for female workers continues to be limited.

Abbreviations

ADDIE: Analysis, Design, Development, Implementation, and Evaluation;
CHEN: Continuous Health Examination Network;
GP2SP: Gerakan Pekerja Perempuan Sehat Produktif (Healthy and Productive Female Workers Movement);
MMR: Maternal Mortality Rate;
OSH: Occupational Safety and Health;
OHS: Occupational Health and Safety;
PEM: Protein Energy Malnutrition;
PPE: Personal Protective Equipment;
R&D: Research and Development;
SDGs: Sustainable Development Goals.

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Conflict of interest

The authors declare no conflict of interest

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Data availability statement

All data generated or analyzed during this study are included in this published manuscript.

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