ORIGINAL ARTICLE

Effects of a community-based participatory educational program on knowledge, attitude, and practice for preventing work-related musculoskeletal disorders risks among rural workers: A quasi-experimental study

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ABSTRACT

Work-related musculoskeletal disorders (WMSDs) have become a paramount concern in occupational health, significantly affecting the well-being and efficiency of laborers across diverse sectors. This research aims to investigate the effects of a community-based participatory educational program on enhancing knowledge, attitude, and practice (KAP) for preventing WMSD risks among rural workers in Phayao province, Thailand. A single-group quasi-experimental design was employed, with assessments conducted at the baseline (T_1), post-program (T_2), and follow-up post-program (T_3) stages. The participants attended an eight-week educational program. Data collection tools included demographic characteristics, assessment of KAP related to WMSDs, and evaluation of WMSD risks. The data were analyzed using descriptive statistics and repeated-measures analysis of variance. In total, 90 participants were included in the study, with an average age of 47.6 ± 10.6 years. More than two-thirds of the participants were classified as general workers. The results indicated a significant increase in knowledge scores, rising from 6.78 ± 1.59 at baseline to 9.56 ± 0.70 post-program and maintaining at 8.59 ± 1.06 after follow-up (p-value < 0.001, η^2 = 0.681). Attitude scores also demonstrated a significant improvement, increasing from 36.43 ± 6.92 to 46.66 ± 1.94 post-program and remaining at 45.97 ± 2.05 after follow-up (p-value < 0.001, η^2 = 0.674). Practice scores witnessed a substantial increase from 19.31 ± 6.49 at baseline to 38.54 ± 1.18 post-program, maintaining at 37.79 ± 1.34 after follow-up (p-value < 0.001, η^2 = 0.881). Furthermore, the results indicated a notable decrease in WMSD risks post-program intervention, sustained after follow-up. The study suggests that integrating a community-based educational program successfully enhanced participants' KAP related to WMSD risks. These findings provide valuable insights to the expanding body of evidence, offering pertinent information for policymakers.

Key words:
community health workers; community-based participatory; health behavior; KAP model; musculoskeletal disorder; occupational health

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INTRODUCTION

Musculoskeletal disorders (MSDs) encompass pathological injuries affecting the bones, ligaments, joints, muscles, nerves, vascular system, and other components of the musculoskeletal system, with potential repercussions on overall bodily function.[1-4] MSDs are prevalent across the population, posing a significant burden in terms of global health, social, and economic costs.[1,2] Work-related MSDs arise from repetitive movements such as bending, crawling, twisting, lifting, pushing, and pulling that are specifically linked to the workplace environment. The World Health Organization (WHO) categorizes WMSDs into acute and chronic injuries, with acute injuries requiring immediate healthcare attention and chronic injuries developing slowly, causing lingering discomfort. Healthcare intervention for chronic injuries depends on their nature, severity, and impact on work performance.[3]

With the rising prominence of WMSDs in occupational health, the well-being and efficiency of workers across diverse sectors have significantly been affected.[5,6] Systematic reviews on WMSDs spanning various occupations and countries reveal distinct prevalence rates and associated risk factors. Noteworthy is the susceptibility variation among different groups: handicraft workers (38.5%–100%),[7] farmers (77%),[8] construction workers (51.1%),[9] and even healthcare professionals, including physiotherapists (90%)[10] and nurses (71.85%).[11] This concern is particularly critical within the rural workforce of Thailand, which is a demographic predominantly engaged in arduous vocations such as agriculture,[12,13] construction,[14] and manual work.[15,16] Despite advancements in automation and technology, manual labor persists in numerous production processes. Rural workers in Thailand face distinctive challenges, including diminished regulatory supervision, limited availability of healthcare facilities, and disparities in awareness of occupational health hazards. In these exceptional circumstances, instituting focused interventions, addressing not only the immediate manifestations of WMSDs but also the fundamental KAP of these workers, is essential.

Promoting an understanding of the KAP related to WMSD risks among rural workers is crucial for raising awareness. The concept of community-based participatory educational programs has emerged as a promising approach for addressing WMSD risks.[17-20] Among these concepts, the KAP model stands out for its malleability and participatory characteristics. It effectively involves the community in identifying, rectifying, and preventing health-related concerns, making it an appropriate framework for addressing the intricate predicaments associated with WMSD risks in rural areas.[21,22] Considering the scope of current research evidence, the KAP model may exhibit synergistic effects within a community-based participatory design.[23,24] However, there is limited evidence from rural workers.

Previous studies have explored the situations of work-related diseases and risk factors related to MSDs.[13, 25-27] However, studies on programs that encourage improved occupational safety behaviors in rural workers are limited. Therefore, this study developed an intervention program based on the KAP model by modifying it to be appropriate for specific study settings. This research aims to investigate how effective a community-based participatory educational program can be in improving KAP for preventing WMSD risks among rural workers in Thailand's Phayao province. The results have the capacity to guide the formulation of policies,

workplace interventions, and public health strategies targeted at alleviating the impact of WMSDs among rural workers in Thailand and comparable settings. By examining the feasibility and efficacy of the KAP model, this study intends to add to the continuous discourse in public health research, addressing the crucial convergence of community engagement and occupational health.

METHODS

Data and Participants

A pragmatic, community-based, single-group, quasi-experimental design with repeated measures was implemented in the Dok Khamtai district of Phayao province, Thailand, between July and September 2023. The sample size was determined through a power calculation, accounting for an estimated attrition rate. With a significance level (α) of 0.05, a power of 0.85, an effect size of 0.15, and three-time measurements, the G*Power version 3.1 software indicated a minimum sample requirement of 83 participants. To accommodate potential dropouts, an additional 10% was included in the calculations, resulting in a total of 92 participants for this single-group study. A convenience sampling strategy was employed, selecting one person per working household. All participants had resided in the study area for a minimum of one year and were aged 15–59 years. The recruits willingly participated in the study and provided informed consent. Pre-test assessments were administered through face-to-face interviews, while post-test assessments were conducted upon completion of the educational program and again at an eight-week interval after post-program completion (Figure 1).

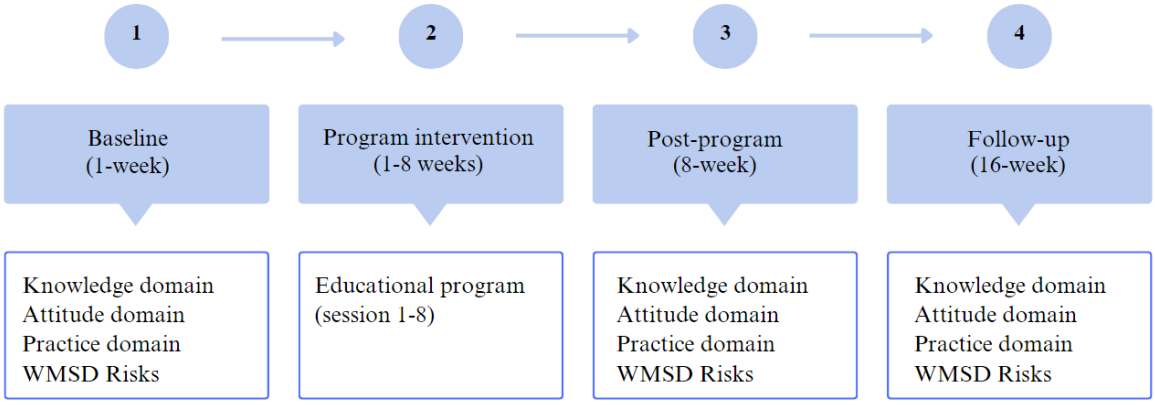

Figure 1. The single group quasi-experimental design employed in this study.

Procedure and Instrumentation

This study unfolded in three phases. Firstly, a literature review was conducted on WMSDs among rural workers, and baseline data for rural workers in the study area, including general information and occupational risk behaviors, was collected. Secondly, the information gathered in the first phase was utilized to develop and implement an educational program. Finally, the effects of the educational program were determined by measuring and comparing changes in the scores of educational domains (KAP) from the baseline, post-program, and follow-up stages, including the prevalence of WMSD risks (Figure 1).

The questionnaire was developed after the literature review and validated by three experts. It was utilized to collect data in three parts. The first part included baseline characteristics information from participants, encompassing variables such as gender, age, body mass index (BMI), marital status, education level, occupation,

adequacy of family income, underlying disease, history of occupational disease, regular intake of medication for WMSDs, and weekly working hours.

The second part consisted of three domains of KAP related to WMSDs. Firstly, 10 items were designed to assess participants' knowledge, with each correct answer scored as 1 point, resulting in a total knowledge score ranging from 0 to 10. A higher total score indicated a more comprehensive understanding of WMSDs. The assessment's internal consistency was validated by using the Kuder-Richardson Formula 20,[28] a reliability measure for tests with binary variables, yielding a reliability coefficient of 0.82. The second domain comprised 10 items assessing attitudes, and the third domain also involved 10 items evaluating practices related to WMSDs. Participants provided responses on a 5-point Likert scale, ranging from strongly disagree (1 point) to strongly agree (5 points). Total scores for both attitude and practice ranged from 10 to 50, with higher scores indicating elevated levels of both attitude and practice regarding WMSDs. The reliability of the questionnaire was confirmed by calculating Cronbach's alpha coefficient,[29] which exceeded 0.84.

The final part included an assessment of WMSDs risks developed by the Thailand Department of Disease Control[30] in three subdomains: Risk 1 focused on health conditions related to WMSD risks (six items), such as underlying diseases, history of accidents, smoking, and alcohol consumption; Risk 2 examined work history and job description related to WMSD risks (six items), including work-related injuries and job descriptions, with respondents considered at risk if they answer yes to just one of the yes/no questions; and Risk 3 involved a body discomfort assessment (12 items). This assessment evaluated the level of discomfort in various body regions, including the head, neck, eyes, upper back, shoulders, and lower back.

Intervention

The study employed a community-based participatory approach[31] with multiple components in a complex intervention program. This was prompted by the identification of WMSDs as the top-priority health concern by the community during the previous project activity. The researchers developed a capacity-building program based on the KAP model,[32] focusing on essential KAP concepts for rural workers. In this program, rural workers and stakeholders were invited to participate in the establishment and development of a comprehensive initiative for addressing and mitigating WMSD concerns. Subsequently, the program content underwent assessment for appropriateness and feasibility by five experts and stakeholders, and adjustments were made based on their suggestions. The program comprised eight weekly, two-hour sessions covering the following topics:

• Week 1: Introduction and understanding WMSDs—The session included an introduction of the researcher and colleagues, expression of the program's educational goals, participants' self-introductions to create a comfortable atmosphere, and training focused on the knowledge of WMSDs. In-depth discussions covered causes and contributing factors of WMSDs, common symptoms and warning signs, risk factors for developing WMSDs, methods of diagnosis, and possible complications of untreated WMSDs.

• Week 2: Enhancing attitude and awareness of WMSDs—This session involved illustrating real-life stories of individuals affected by WMSDs through a video, facilitating a group discussion after the video screening, encouraging the

participants to share their feelings, thoughts, and concerns about WMSDs, and explaining the significance of a positive attitude toward WMSD prevention.

• Week 3: Understanding personal anatomy and prevention—In the third week, the session comprehensively focused on personal anatomy, with practical demonstrations and hands-on activities to educate the participants on proper body mechanics. Several techniques for preventing WMSDs while working were taught, and the discussions thereafter covered the importance of maintaining good posture and ergonomics in different work environments.

• Week 4: Group discussion on WMSD risks and prevention—Researchers and colleagues facilitated a group discussion in the fourth week's session, utilizing photographs or diagrams to identify specific risks related to WMSDs in the community. The group brainstormed prevention strategies, emphasizing community-specific solutions, and the participants were encouraged to share related personal experiences and insights.

• Week 5: Identifying early symptoms and seeking help—This session educated the participants on recognizing early symptoms of WMSDs and discussed the significance of early intervention and seeking medical attention. Information on local healthcare services and available resources was also provided, and case studies of individuals who successfully managed WMSDs through early intervention were shared.

• Week 6: Ergonomics and workplace modifications—The sixth session delved into the science of ergonomics and its role in minimizing WMSD risks. Practical examples of ergonomic modifications for various workplaces were offered, and a site visit to a local workplace was organized to demonstrate ergonomics in practice. The participants were also encouraged to identify ergonomic improvements in their own workplaces.

• Week 7: Practical exercises and stretching—The participants were introduced to a set of stretching and strengthening exercises tailored to prevent WMSDs in the seventh week. A hands-on session allowed them to practice these exercises and emphasized the importance of incorporating them into daily routines. The impact of physical fitness on WMSD prevention was also discussed.

• Week 8: Review and future steps—The final session recapped key takeaways from the program and encouraged the participants to share their experiences and how their knowledge and practices had evolved during the program. Future steps such as the formation of support groups, ongoing access to resources, or community initiatives to promote WMSD prevention were also discussed. Feedback from participants was collected to make improvements for future programs.

Statistical Analyses

The data collected in this study were meticulously organized and analyzed using IBM SPSS Statistics software, version 29.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were employed to describe participants' characteristics at baseline. General linear model repeated-measures analysis of variance was used to quantify and test the statistical significance of the program effect for each time point of the score. Greenhouse-Geisser correction was applied when Mauchly's test of sphericity did not achieve significance, and Bonferroni adjustments were performed for pairwise comparisons. The p-value < 0.05 were considered statistically significant.

Ethics Statement

This study strictly adhered to the ethical principles outlined in the Declaration of Helsinki. Approval and ethical clearance were obtained from the

Phayao Human Ethics Committee at the University of Phayao, with the assigned Institutional Review Board (IRB) approval reference number UP-HEC 1.2/080/66. The necessary authorization to conduct the study was explicitly obtained from the relevant local authorities. Written consent was obtained from all the participants in the study, following a thorough explanation of the study's nature and objectives. Furthermore, particular attention was given to maintaining the confidentiality and anonymity of all the participants throughout the entire research process.

RESULTS

In total, 90 participants were included in the study. Most of the participants were female, constituting 63.3% of the total, while males accounted for only 36.7%. The average age of the participants was 47.6 ± 10.6 years. More than one-third of the participants reported a normal BMI (42.3%), and over half of them were married (61.1%). Two-thirds of the participants had completed elementary school or a lower level of education (66.7%). By profession, 64.4% were general workers or employees employed to do general work, and 27.8% were agriculturists. Family income was reported as inadequate by 63.3%. Nearly half of the participants reported having an underlying disease (46.7%), and a few of them had a history of occupational disease (6.7%). Regular intake of medication for WMSDs was reported by 48.9% of the participants, with 62.2% working more than 48 hours per week (Table 1).

Table 1. Baseline characteristics of participants.

Variable	n (%)
Gender	
Male	33 (36.7)
Female	57 (63.3)
Age (years), mean ± SD	47.6 ± 10.6
Body mass index (kg/m^2)	
Underweight (< 18.5)	13 (14.4)
Normal (18.5-22.9)	38 (42.3)
Overweight (23.0-24.9)	13 (14.4)
Obese (> 24.9)	26 (28.9)
Marital status	
Single	23 (25.6)
Married	55 (61.1)
Widowed/divorced/separated	12 (13.3)
Education level	
Elementary school or lower	60 (66.7)
High school	23 (25.6)
Diploma / high vocational certificate	6 (6.7)
Bachelor's degrees or above	1 (1.1)
Occupation	
Agriculturists	25 (27.8)
General workers	58 (64.4)
Merchants	2 (2.2)
Personal business	5 (5.6)
Adequacy of family income	
Inadequate	57 (63.3)

Variable	n (%)
Adequate but no savings	31 (34.4)
Adequate and savings	2 (2.2)
Underlying disease	
No	48 (53.3)
Yes	42 (46.7)
History of occupational disease	
No	84 (93.3)
Yes	6 (6.7)
Regular intake of medication for WMSDs	
No	46 (51.1)
Yes	44 (48.9)
Weekly working hours	
≤ 48 hours	34 (37.8)
> 48 hours	56 (62.2)

Knowledge scores significantly increased from baseline (6.78 ± 1.59) to post-program (9.56 ± 0.70), maintaining at 8.59 ± 1.06 after follow-up (p-value < 0.001, η^2 = 0.681). Similarly, attitude scores improved significantly from 36.43 ± 6.92 to 46.66 ± 1.94 post-program, remaining at 45.97 ± 2.05 after follow-up (p-value < 0.001, η^2 = 0.674). Practice scores showed a substantial increase from baseline (19.31 ± 6.49) to post-program (38.54 ± 1.18) and remained high at 37.79 ± 1.34 after follow-up (p-value < 0.001, η^2 = 0.881). The Greenhouse-Geisser p-value was less than 0.05, indicating statistical significance (Table 2 and Figure 2).

Table 2. Score of knowledge, attitude, and practice on the prevention of work-related musculoskeletal disorders.

Educational domain	Mean ± SD			p-value	η^2
	Baseline (T_1)	Post-program (T_2)	Follow-up (T_3)		
Knowledge (0-10 scores)	6.78 ± 1.59	9.56 ± 0.70	8.59 ± 1.06	<0.001	0.681
Attitude (10-50 scores)	36.43 ± 6.92	46.66 ± 1.94	45.97 ± 2.05	<0.001	0.674
Practice (10-50 scores)	19.31 ± 6.49	38.54 ± 1.18	37.79 ± 1.34	<0.001	0.881

η^2, partial Eta square; Greenhouse-Geisser p-value < 0.05

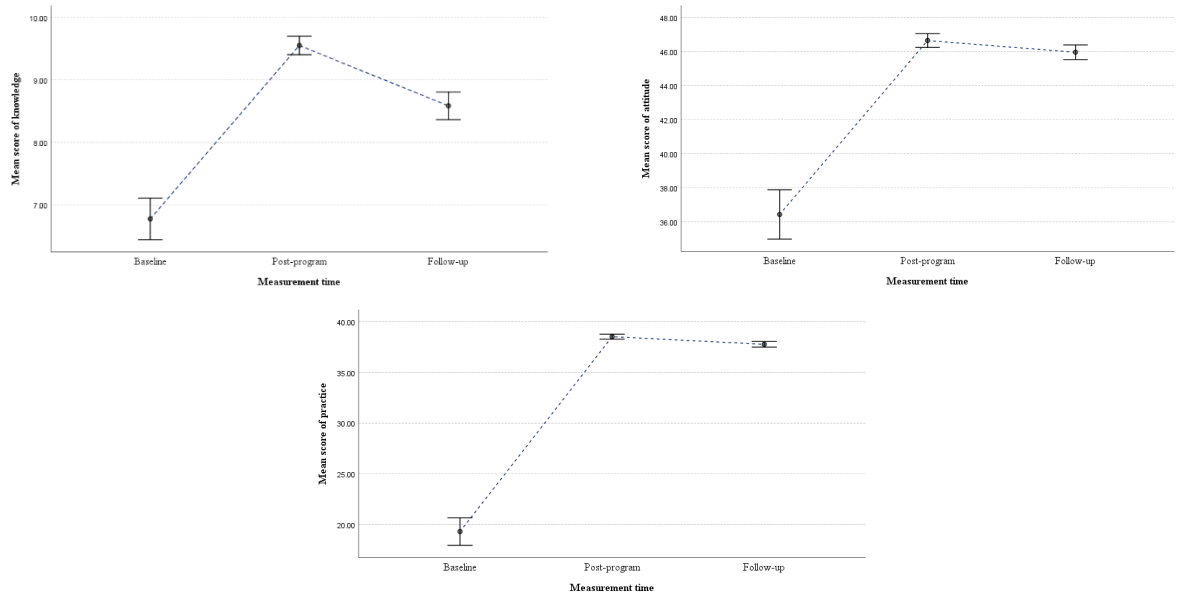

Figure 2. Baseline, post-program, and follow-up analysis of mean scores by educational domain on the prevention of work-related musculoskeletal disorders risks.

Pairwise comparisons of KAP scores in the prevention of WMSDs reveal significant improvements. Post-training scores are notably higher than baseline scores (p-value < 0.001), and follow-up scores, also with p-value < 0.001, remain significantly improved compared to the baseline. Although there are small decreases in scores from post-training to follow-up, these differences remain statistically significant (p-value < 0.001) (Table 3).

Table 3 Pairwise comparisons of knowledge, attitude, and practice scores on the prevention of work-related musculoskeletal disorders.

	Mean difference					
Educational domain	**T_2 vs T_1**	***p*-value**	**T_3 vs T_1**	***p*-value**	**T_3 vs T_2**	***p*-value**
Knowledge (0-10 scores)	2.78	<0.001	1.81	<0.001	-0.967	<0.001
Attitude (10-50 scores)	10.22	<0.001	9.53	<0.001	-0.69	<0.001
Practice (10-50 scores)	19.23	<0.001	18.48	<0.001	-0.76	<0.001

The data on specific risks, assessed at the baseline, post-program, and follow-up stages, demonstrate noteworthy trends. For risk 1, the proportion of cases with the risk substantially decreased from 85.6% in the baseline to 2.2% post-program and further to 1.1% during follow-up. In risk 2, all cases had the risk at baseline, decreasing to 7.8% post-program and 4.4% in follow-up. Risk 3 followed a similar pattern, starting at 100% in baseline, decreasing to 17.8% post-program, and finally to 12.2% in follow-up. These findings indicated a significant reduction in the prevalence of these risks after program intervention, with sustained improvements during the follow-up period (Figure 3).

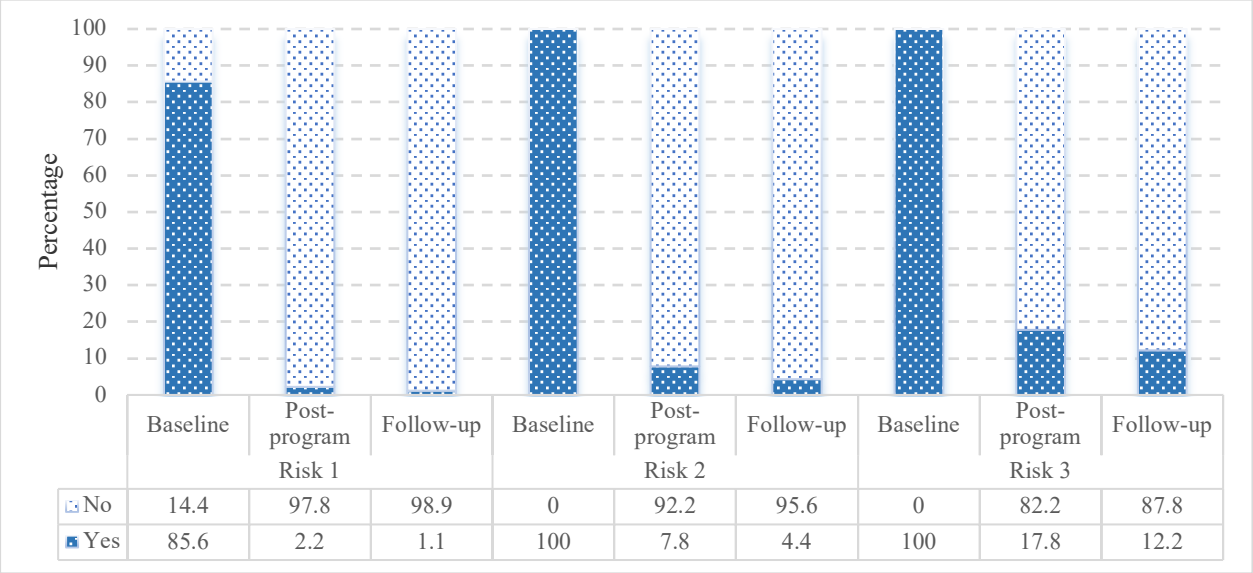

Figure 3. The prevalence of work-related musculoskeletal disorders risk domains

DISCUSSION

The findings of this study underscore the effectiveness of the community-based participatory educational program in enhancing knowledge, attitudes, and practices related to the prevention of WMSDs among rural workers. These results imply that the features of community-based participatory initiatives heightened participants' health awareness and motivation for preventing WMSDs.[23,33] This further underscores the efficacy of the implemented multiple-component intervention aimed at improving musculoskeletal health and reducing exposure risks within the studied occupational group.[34] However, for more targeted interventions, it is essential to conduct program interventions based on the participants' baseline data at both individual and socio-environmental settings.[32,35] Such a comprehensive approach is expected to be more effective in reducing WMSDs.

The observed improvements in knowledge scores, indicating a substantial increase from baseline to post-program and sustained levels during follow-up, underscore the effectiveness of the intervention in enhancing participants' understanding of WMSDs. Likewise, the positive shift in attitude scores from baseline to post-program, with a maintained positive trajectory during follow-up, suggests a lasting positive influence on participants' perceptions and beliefs related to WMSD prevention. This attitudinal change is crucial, as it often serves as a precursor to behavioral modifications. The substantial increase in practice scores from baseline to post-program and the retention of these improved practices during follow-up further highlight the practical impact of the intervention. Our findings align with those of several previous studies that have shown that educational interventions significantly improved workers' knowledge,[36-39] attitude,[36,37,39] and practices[36, 38-40] regarding WMSD risks after the educational intervention.

Based on the results of the study in the intervention program, the participants not only gained knowledge and developed positive attitudes but also translated these into tangible changes in their workplace practices. This achievement is fundamental for the effective prevention of WMSDs. The outcomes align with the relationship among knowledge, attitude, and practices,

which are critical components of behavioral change models.[32,41] Moreover, the data from the KAP model can assist in identifying knowledge gaps, attitude barriers, and practice patterns that may enhance understanding and actions concerning a particular issue.[42]

In this intervention program, there seem to be no significant long-term effects on KAP related to the prevention of WMSD risks. Existing evidence suggests that many interventions primarily yield short-term effects, particularly on practices or behavioral changes, but achieving sustained change continues to be a significant challenge.[23,43] This indicates a need for sustained efforts to reinforce the acquired KAP among participants. Factors contributing to this lack of sustainability may include challenges in maintaining new habits or limitations in ongoing support. Therefore, future interventions should address these challenges, and emphasize the importance of long-term strategies and continuous education to ensure enduring positive outcomes in WMSD prevention among rural communities. Additionally, future studies could also involve participants' family members or primary caregivers in intervention programs to provide a more comprehensive understanding of outcomes.[23] This approach acknowledges the significant role of support systems, offering valuable insights into intervention dynamics for increased real-world applicability.

The current study presents empirical evidence that substantiates the prevalence of specific risks at the baseline, post-program, and follow-up stages, offering a visual representation of the tangible outcomes of the intervention. The significant reduction in the prevalence of identified risks post-intervention, sustained during follow-up, underscores the real-world impact of the preventive measures implemented. This implies that the educational program proposed in this study is effective in reducing WMSD risks and that increased KAP of the subject could lead to a decrease in WMSDs. Preceding investigations conducted among nursing staff found that the overall risk of WMSDs decreased in the intervention group after participation in the educational program.[44] Additionally, our results correspond with a study undertaken among school teachers, which found that the self-reported prevalence of WMSDs for neck, shoulder, upper and lower back pain, or discomfort was considerably lower than before the intervention.[36] Furthermore, the study among dairy workers using a multicomponent intervention involving individual and organizational changes showed significant improvements in musculoskeletal outcomes and reduction in exposure risks after the intervention.[34] These recommendations are also supported by a study among female textile workers, which found that preventive measures and worksite interventions on KAP are needed to reduce WMSDs.[22]

The strength of the study lies in the implementation of a well-designed eight-week intervention program based on a precise protocol. Moreover, the ability to implement this intervention using the available facilities of primary healthcare centers in rural neighborhoods enhances its generalizability and extends its applicability to other local contexts. However, the findings of this study should be interpreted in the context of the study's limitations. Firstly, the quasi-experimental design without a control group is a significant limitation, as contamination could not be adequately examined. Thus, non-randomization was the primary constraint of this study. Secondly, the quasi-experimental nature of the study limits its generalizability. Thirdly, data collection through face-to-face interviews introduces the possibility of social

desirability bias, wherein participants might provide responses they perceive as more favorable. Lastly, the possibility that measurement errors occurred due to respondents being repeatedly exposed to the same survey questions could not be excluded.

CONCLUSION

Therefore, it can be concluded that the program demonstrated a significant enhancement in the participants' KAP concerning the prevention of WMSD risks. These findings contribute substantial insights to the field, emphasizing the pivotal role of community-based participatory and multiple-component intervention programs in instigating enduring changes in KAP related to occupational health and safety. To ensure sustainable KAP modification, it is recommended to periodically reiterate this program activity while accompanying it by concise, intermittent reminders addressing WMSD risks. Future research initiatives hold the potential to refine the sustainable long-term effects and scalability of such programs across diverse occupational settings.

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