

Original Research Article

EFFECTIVENESS OF A NURSE-LED TEACHING INTERVENTION ON KNOWLEDGE AND PREVENTIVE PRACTICES REGARDING INTERSTITIAL LUNG DISEASES AMONG CROP AND LIVESTOCK HANDLERS IN SELECTED RURAL AREAS OF WEST BENGAL: A PRE-EXPERIMENTAL STUDY

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ABSTRACT

Background: Crop and livestock handlers may experience occupational exposure to agricultural dust, moulds, animal-derived materials and other biological agents that may contribute to respiratory health problems, including hypersensitivity pneumonitis and other interstitial lung diseases (ILDs). Improving awareness of occupational respiratory hazards and preventive practices is therefore important in rural occupational-health promotion. The objective is to assess the effectiveness of a nurse-led teaching intervention on knowledge and preventive practices regarding interstitial lung diseases among crop and livestock handlers in selected rural areas of West Bengal.

Materials and Methods: A quantitative pre-experimental one-group pre-test–post-test design was adopted among 60 crop and livestock handlers selected using purposive sampling. Data were collected using a researcher-developed 25-item knowledge questionnaire and a preventive-practice scale. A nurse-led teaching intervention comprising three 45-minute sessions was provided following the pre-test, and the post-test was conducted three days later. Data were analysed using descriptive statistics, paired t-test and chi-square test.

Results: The mean knowledge score increased from 12.75 ± 3.11 in the pre-test to 20.15 ± 2.88 in the post-test, with a mean improvement of 7.40 points ($t=23.52$, $df=59$, $p<0.001$). The mean preventive-practice score increased from 18.40 ± 4.32 to 26.60 ± 5.10 , representing a mean improvement of 8.20 points ($t=23.32$, $df=59$, $p<0.001$). No statistically significant association was observed between pre-test knowledge level and the selected demographic and occupational variables ($p>0.05$).

Conclusion: The nurse-led teaching intervention was associated with substantial short-term improvement in participants' knowledge and reported preventive-practice scores. However, the one-group pre-test–post-test design without a control group limits causal interpretation. The findings should therefore be considered preliminary and require confirmation through larger controlled studies with longer follow-up.

Keywords: Interstitial lung disease; hypersensitivity pneumonitis; agricultural workers; occupational health; nurse-led intervention; preventive practices; rural health; West Bengal.

INTRODUCTION

Interstitial lung diseases comprise a heterogeneous group of pulmonary disorders characterized by inflammation, injury and/or fibrosis involving the lung interstitium. The causes and clinical presentations of ILDs vary considerably. Some forms are associated with environmental or occupational exposures, while others are idiopathic or related to systemic diseases.

Agricultural occupations are associated with exposure to several inhaled hazards. Crop handlers may be exposed to dust generated during harvesting, threshing, processing, transportation and storage of agricultural products. Livestock handlers may additionally encounter animal proteins, feed particles, moulds, bacteria and other biological materials. Repeated exposure to organic materials may be particularly relevant to hypersensitivity pneumonitis.

Hypersensitivity pneumonitis is an immune-mediated inflammatory and/or fibrotic lung disease associated with inhalation of specific environmental or occupational antigens. Agricultural activities are among the recognized occupational contexts in which relevant exposures can occur. Exposure history is therefore an important component of respiratory health assessment.

Farmers and agricultural workers may not always recognize the relationship between occupational exposures and respiratory symptoms. Cough, breathlessness, chest discomfort and reduced exercise tolerance may be overlooked or attributed to routine occupational fatigue. Limited awareness can delay preventive action and healthcare consultation. Preventive measures may include reducing exposure to dusty materials, improving workplace ventilation, avoiding handling of mould-contaminated materials whenever possible, using suitable respiratory protection, maintaining livestock-shelter hygiene, improving storage conditions and seeking medical evaluation when persistent respiratory symptoms develop.

Community health nurses have an important role in occupational health promotion. Through structured health education, nurses can improve awareness regarding occupational hazards, promote preventive behaviour and encourage early health-seeking practices.

The present study therefore examined the effect of a structured nurse-led teaching intervention on knowledge and preventive practices regarding ILDs among crop and livestock handlers in a rural community of West Bengal.

Need for the Study

Agriculture remains an important source of livelihood in rural communities. Agricultural workers may spend several hours each day in environments where dust, organic material, animal feed, moulds and other biological agents are present.

Occupational exposure to agricultural aerosols has been associated with respiratory disorders including asthma, chronic obstructive pulmonary disease, hypersensitivity pneumonitis and interstitial lung diseases. Previous research has demonstrated that agricultural environments can contain multiple potentially harmful inhaled agents.

A systematic review of occupational causes of hypersensitivity pneumonitis identified agricultural, plant-processing and animal-related occupational exposures among recognized sources of disease. The findings emphasize the importance of obtaining detailed occupational exposure histories in individuals at risk of hypersensitivity pneumonitis.

Evidence from systematic reviews and meta-analyses has also reported associations between farming or agricultural work and idiopathic pulmonary fibrosis. Agricultural dust and other occupational exposures may therefore represent an important area for preventive respiratory-health interventions.

In rural communities, health education may provide a relatively simple method of improving awareness about occupational respiratory hazards. Nurses can communicate information in locally understandable language and demonstrate practical measures such as respiratory protection, safe material handling, ventilation and early reporting of symptoms.

Despite the importance of occupational respiratory health, agricultural workers may have limited knowledge regarding ILDs and their prevention. A structured nurse-led educational intervention may therefore be useful in improving knowledge and promoting appropriate preventive practices.

Statement of the Problem

“A study to assess the effectiveness of a nurse-led teaching intervention on knowledge and preventive practices regarding interstitial lung diseases among crop and livestock handlers in selected rural areas of West Bengal: a pre-experimental study.”

Aim of the Study

The aim of the study was to assess the effectiveness of a nurse-led teaching intervention on knowledge and preventive practices regarding interstitial lung diseases among crop and livestock handlers in selected rural areas of West Bengal.

Objectives

1. To assess the pre-test and post-test levels of knowledge regarding interstitial lung diseases and their prevention among crop and livestock handlers.
2. To assess the pre-test and post-test levels of preventive practices regarding occupational respiratory hazard prevention among crop and livestock handlers.
3. To determine the effectiveness of a nurse-led teaching intervention by comparing the pre-test and post-test knowledge and preventive-practice scores regarding interstitial lung diseases and their prevention among crop and livestock handlers.
4. To determine the association between pre-test levels of knowledge regarding interstitial lung

diseases and occupational respiratory hazard prevention with selected demographic variables among crop and livestock handlers.

Hypotheses

H1: There will be a statistically significant difference between the mean pre-test and post-test knowledge scores regarding interstitial lung diseases among crop and livestock handlers.

H2: There will be a statistically significant difference between the mean pre-test and post-test preventive-practice scores regarding prevention of occupational respiratory hazards among crop and livestock handlers.

MATERIALS AND METHODS

Research Approach

A quantitative research approach was adopted to assess the knowledge and preventive practices regarding interstitial lung diseases (ILDs) and occupational respiratory hazards among crop and livestock handlers and to evaluate the effect of a nurse-led teaching intervention.

Research Design

A pre-experimental one-group pre-test–post-test design was employed.

Design: $O_1 \rightarrow X \rightarrow O_2$

Where:

- O_1 = Pre-test assessment of knowledge and preventive practices
- X = Nurse-led teaching intervention on interstitial lung diseases and their prevention
- O_2 = Post-test assessment of knowledge and preventive practices

Study Setting: The study was conducted in selected rural areas of West Bengal, India, where crop and livestock handling activities are commonly undertaken.

Study Population: The study population comprised adult crop and livestock handlers residing in the selected rural community who were involved in agricultural and/or livestock-related activities.

Sample Size: The sample consisted of 60 adult crop and livestock handlers who met the predetermined eligibility criteria.

Sampling Technique: A purposive sampling technique was used to select 60 eligible crop and livestock handlers from the selected rural areas of West Bengal.

Sample Selection Criteria

Inclusion Criteria

Participants were eligible for inclusion if they:

1. were 18 years of age or older
2. were engaged in crop cultivation, crop handling, livestock handling, or related agricultural activities
3. had been engaged in such activities for at least one year
4. were residents of the selected rural study area
5. were willing to participate in the study
6. were able to understand Bengali or English

7. were available for both pre-test and post-test assessments.

Exclusion Criteria

Participants were excluded if they:

1. declined to participate in the study
2. were unable to complete the study questionnaire
3. were medically unstable at the time of data collection
4. were unavailable for the scheduled post-test assessment.

Development of the nurse-led teaching intervention: The intervention was developed by the researcher based on the objectives of the study, occupational respiratory-health concepts and relevant literature.

The content was reviewed by subject experts for relevance, clarity, comprehensiveness and appropriateness for rural agricultural workers.

The educational programme consisted of three sessions of 45 minutes each.

Session 1: Understanding ILDs and Occupational Respiratory Hazards

The first session introduced participants to the fundamental concepts of interstitial lung diseases (ILDs) and occupational respiratory health. The session covered the meaning and basic understanding of ILDs, the anatomy and functions of the respiratory system, and common occupational respiratory hazards encountered during agricultural work. Particular emphasis was placed on exposure to agricultural dust, crop-related materials, livestock-associated exposures, moulds and fungi, and animal-derived biological materials. Participants were also educated about common respiratory symptoms that require medical attention and the importance of early recognition of symptoms for timely evaluation and appropriate management.

Session 2: Risk Factors and Exposure Reduction

The second session focused on occupational risk factors and practical measures for reducing respiratory exposure in agricultural work. Participants were educated about the health risks associated with repeated exposure to organic dust, particularly during the handling of mouldy hay and crop materials, as well as during grain and feed storage. The session also addressed exposure within livestock shelters and emphasized the importance of adequate workplace ventilation. Practical preventive measures included reducing dust generation, adopting safe handling and storage practices, maintaining personal hygiene, and minimizing unnecessary exposure to potentially hazardous agricultural materials.

Session 3: Preventive Practices and Health-Seeking Behaviour

The third session focused on respiratory protective measures and the adoption of safe occupational practices. Participants were instructed on the appropriate use of masks and other respiratory protective equipment, including their proper cleaning and maintenance. The session emphasized adequate ventilation, safe agricultural practices, and

maintenance of hygiene in livestock sheds to minimize occupational respiratory exposure. Participants were also encouraged to report persistent respiratory symptoms, particularly cough or breathlessness, at an early stage and to seek appropriate medical consultation. The importance of avoiding self-medication and maintaining regular attention to occupational respiratory health was reinforced throughout the session.

The sessions were delivered by the researcher using explanation, discussion, examples and health-education materials in Bengali and Hindi according to participant understanding.

Description of Data Collection Tools

Section A consisted of a structured demographic and occupational proforma comprising 10 variables: age, sex, educational status, type of agricultural or livestock work, duration of occupational exposure, average working hours per day, frequency of exposure to agricultural or livestock dust, exposure to mouldy hay, grain, feed or other organic materials, availability and regular use of respiratory protective equipment, and smoking or tobacco use. These variables were selected to characterize the participants sociodemographic profile and major occupational and behavioural factors relevant to respiratory health.

Section B: Knowledge Questionnaire

A researcher-developed structured questionnaire consisting of 25 multiple-choice items was used.

Each correct response received one mark and each incorrect response received zero marks.

Maximum score = 25.

The knowledge score was categorized as:

Score	Interpretation
0–12	Inadequate knowledge
13–18	Moderately adequate knowledge
19–25	Adequate knowledge

The content validity of the knowledge instrument was established through expert evaluation, yielding a content validity index (CVI) of 0.86. The internal consistency and reliability of the instrument were assessed using the Kuder–Richardson Formula 20 (KR-20), which demonstrated a reliability coefficient of 0.82, indicating satisfactory reliability for assessing participants' knowledge regarding interstitial lung diseases and their prevention.

Section C: Preventive-Practice Scale

A researcher-developed 30-item preventive-practice scale was used to assess the participants' routine practices related to the prevention of occupational respiratory hazards. The scale covered practical measures related to dust reduction, use of respiratory protection, workplace ventilation, safe crop handling, livestock-shelter hygiene, safe storage of agricultural materials, personal hygiene, and appropriate health-seeking behaviour. Each item was scored according to the predefined response options, with higher scores indicating better preventive practices. The internal consistency of the scale was assessed using Cronbach's alpha, which yielded a reliability coefficient of 0.84, indicating satisfactory reliability of the instrument.

For interpretation, the total preventive-practice score was categorized into three levels: poor practice, moderate practice, and good practice, based on the predefined scoring criteria.

Data Collection Procedure

After obtaining permission from the concerned authority, eligible participants were identified.

The purpose of the study was explained to each participant and informed consent was obtained. A pre-test was conducted using the demographic proforma, knowledge questionnaire and preventive-practice scale.

The nurse-led teaching intervention was then provided in three sessions of 45 minutes each.

The post-test was conducted three days after completion of the intervention using the same knowledge questionnaire and preventive-practice scale. Confidentiality and anonymity were maintained throughout the study.

Statistical Analysis

The collected data were organized and analysed using descriptive and inferential statistics.

Frequency and percentage were used for categorical variables. Mean and standard deviation were used for continuous variables. Paired t-test was used to compare pre-test and post-test scores. Chi-square test was used to assess associations between pre-test categorical levels and selected demographic variables. Statistical significance was considered at $p < 0.05$.

RESULTS

[Table 1] Distribution of Participants According to Selected Demographic Characteristics (N=60)

Table 1: Sociodemographic and Occupational Characteristics of the Participants (N = 60)

Variable	Category	n	%
Age	18–30 years	24	40.0
	31–40 years	21	35.0
	>40 years	15	25.0
Sex	Male	38	63.3
	Female	22	36.7
Educational status	Primary education	17	28.3
	Secondary education	26	43.3
	Higher secondary and above	17	28.3
Type of agricultural/livestock work	Crop handling only	29	48.3
	Livestock handling only	12	20.0

	Both crop and livestock work	19	31.7
Duration of occupational exposure	<5 years	18	30.0
	5–10 years	24	40.0
	>10 years	18	30.0
Average working hours/day	<6 hours	19	31.7
	6–8 hours	27	45.0
	>8 hours	14	23.3
Frequency of agricultural/livestock dust exposure	Occasional	11	18.3
	Frequent	31	51.7
	Daily	18	30.0
Exposure to mouldy hay, grain, feed or other organic materials	No exposure	12	20.0
	Occasional exposure	23	38.3
	Frequent exposure	25	41.7
Availability and regular use of respiratory protective equipment	Regularly available and used	13	21.7
	Available but irregularly used	20	33.3
	Not available/not used	27	45.0
Smoking/tobacco use	Yes	21	35.0
	No	39	65.0

The largest proportion of participants were aged 18–30 years (40.0%), were male (63.3%), had secondary education (43.3%), were engaged primarily in crop handling (48.3%), and had 5–10 years of occupational exposure (40.0%). In terms of occupational exposure, 45.0% reported working 6–8 hours per day, while 51.7% reported frequent

exposure to agricultural or livestock dust. Exposure to mouldy hay, grain, feed, or other organic materials was frequent among 41.7% of participants. Respiratory protective equipment was unavailable or not used by 45.0% of participants, and 35.0% reported smoking or tobacco use.

Table 2: Distribution of Participants According to Pre-test and Post-test Knowledge Level (N=60)

Knowledge level	Pre-test n (%)	Post-test n (%)
Inadequate (0–12)	29 (48.3)	0 (0.0)
Moderately adequate (13–18)	26 (43.3)	20 (33.3)
Adequate (19–25)	5 (8.3)	40 (66.7)
Total	60 (100.0)	60 (100.0)

Table 3: Comparison of Pre-test and Post-test Knowledge Scores (N=60)

Assessment	Mean	SD	Mean difference	Paired t	df	p-value
Pre-test	12.75	3.11	7.40	23.52	59	<0.001
Post-test	20.15	2.88				

The mean knowledge score increased from 12.75 ± 3.11 in the pre-test to 20.15 ± 2.88 in the post-test, representing a mean improvement of 7.40 points. The paired t-test demonstrated a statistically significant difference between the pre-test and post-test knowledge scores ($t = 23.52$, $df = 59$, $p < 0.001^*$). These findings indicate a significant improvement in participants' knowledge regarding interstitial lung diseases and their prevention following the nurse-led teaching intervention.

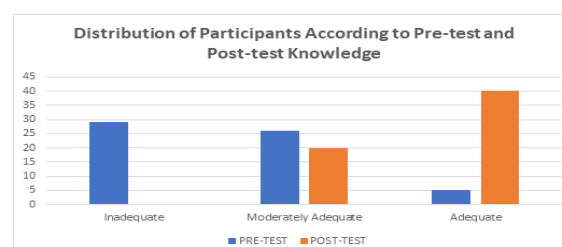


Figure 1: Distribution of Participants According to Pre-test and Post-test Knowledge.

Table 4: Distribution of Participants According to Pre-test and Post-test Preventive-Practice Level (N=60)

Preventive-practice level	Pre-test n (%)	Post-test n (%)
Poor (0–17)	26 (43.3)	1 (1.7)
Moderate (18–26)	31 (51.7)	29 (48.3)
Good (27–35)	3 (5.0)	30 (50.0)
Total	60 (100.0)	60 (100.0)

The distribution of participants according to preventive-practice level showed that, in the pre-test, 31 participants (51.7%) had moderate preventive practices, 26 (43.3%) had poor practices, and only 3 (5.0%) demonstrated good practices. Following the nurse-led teaching intervention, the proportion with

good preventive practices increased to 30 (50.0%), while 29 (48.3%) had moderate practices and only 1 (1.7%) had poor practices. Overall, the findings demonstrate a marked shift from poor and moderate preventive-practice levels towards good practices in the post-test.

Table 5: Comparison of Pre-test and Post-test Preventive-Practice Scores (N=60)

Assessment	Mean	SD	Mean difference	Paired t	df	p-value
Pre-test	18.40	4.32	8.20	23.32	59	<0.001
Post-test	26.60	5.10				

The mean preventive-practice score increased from 18.40 ± 4.32 in the pre-test to 26.60 ± 5.10 in the post-test, with a mean improvement of 8.20 points. The paired t-test demonstrated a statistically significant difference between the pre-test and post-test

preventive-practice scores ($t = 23.32$, $df = 59$, $p < 0.001^*$). These findings indicate a significant improvement in participants' preventive practices regarding occupational respiratory hazard prevention following the nurse-led teaching intervention.

Table 6: Association between Pre-test Knowledge Level and Selected Demographic and Occupational Variables (N = 60)

Variable	Category	Inadequate n	Moderately adequate n	Adequate n	χ^2	df	p-value
Age	18–30 years	13	10	1	1.43	4	0.839
	31–40 years	10	9	2			
	>40 years	6	7	2			
Sex	Male	18	17	3	0.09	2	0.956
	Female	11	9	2			
Educational status	Primary education	9	7	1	0.72	4	0.948
	Secondary education	13	11	2			
	Higher secondary and above	7	8	2			
Type of agricultural/livestock work	Crop handling only	14	13	2	0.22	4	0.994
	Livestock handling only	6	5	1			
	Both crop and livestock work	9	8	2			
Duration of occupational exposure	<5 years	9	8	1	0.22	4	0.994
	5–10 years	11	11	2			
	>10 years	9	8	1			
Average working hours/day	<6 hours	9	9	1	0.81	4	0.937
	6–8 hours	13	12	2			
	>8 hours	7	6	2			
Frequency of agricultural/livestock dust exposure	Occasional	5	5	1	0.39	4	0.983
	Frequent	15	13	3			
	Daily	9	9	1			
Exposure to mouldy hay, grain, feed or other organic materials	No exposure	5	6	1	0.25	4	0.993
	Occasional exposure	11	10	2			
	Frequent exposure	13	11	2			
Availability and regular use of respiratory protective equipment	Regularly available and used	5	7	1	1.02	4	0.907
	Available but irregularly used	9	9	2			
	Not available/not used	15	11	2			
Smoking/tobacco use	Yes	11	8	2	0.37	2	0.832
	No	18	18	3			

No statistically significant association was observed between pre-test knowledge level and any of the selected demographic or occupational variables ($p > 0.05$).

DISCUSSION

The present study assessed the change in knowledge and preventive practices regarding interstitial lung diseases (ILDs) following a nurse-led teaching intervention among crop and livestock handlers in selected rural areas of West Bengal. A pre-experimental one-group pre-test–post-test design was used with 60 participants. The findings indicate a substantial short-term improvement in both knowledge and preventive-practice scores following the intervention.

At baseline, knowledge regarding ILDs was limited. In the pre-test, 48.3% of participants had inadequate knowledge, 43.3% had moderately adequate knowledge, and only 8.3% had adequate knowledge. Following the intervention, no participant remained in the inadequate category, while 66.7% achieved adequate knowledge. This shift reflects a marked improvement in understanding of ILDs and their prevention.

The improvement was also evident in the mean knowledge scores, which increased from 12.75 ± 3.11 to 20.15 ± 2.88 , with a mean difference of 7.40 points. The paired t-test showed a statistically significant difference ($t=23.52$, $df=59$, $p<0.001$), supporting the hypothesis of a significant change in knowledge after the intervention.

These findings are important in the context of agricultural occupations, where workers are frequently exposed to organic dust, moulds, agricultural materials and animal-derived particles. Such exposures may increase the risk of respiratory health problems. Therefore, improving awareness of hazards, preventive measures and early symptom recognition is essential for occupational respiratory health promotion.

A similar improvement was observed in preventive practices. In the pre-test, 43.3% of participants had poor practices and only 5.0% demonstrated good practices. After the intervention, 50.0% demonstrated good practices, while only 1.7% remained in the

poor-practice category. This indicates a positive shift towards better adoption of preventive behaviours.

The mean preventive-practice score increased from 18.40 ± 4.32 to 26.60 ± 5.10 , with a mean improvement of 8.20 points. The difference was statistically significant ($t=23.32$, $df=59$, $p<0.001$), supporting the second hypothesis. These findings suggest that structured nurse-led education can improve reported preventive practices in the short term.

The intervention, delivered in three structured sessions, focused on ILDs, occupational respiratory hazards, exposure reduction, respiratory protection, environmental control and health-seeking behaviour. Such targeted education may enhance awareness and encourage safer occupational practices among agricultural workers.

No statistically significant association was found between pre-test knowledge levels and selected demographic variables such as age, sex and educational status ($p>0.05$). This suggests that inadequate knowledge was broadly distributed across the sample. However, this finding should be interpreted cautiously due to the limited sample size and purposive sampling.

Despite the observed improvements, the findings must be considered in light of the study design. The one-group pre-test–post-test approach does not allow causal attribution of the changes solely to the intervention. Factors such as testing effects, short-term recall and external influences cannot be excluded. Therefore, the results should be interpreted as evidence of observed improvement rather than definitive effectiveness.

The post-test was conducted three days after the intervention, reflecting short-term outcomes. The sustainability of knowledge and behavioural changes over time remains uncertain. Additionally, preventive practices were assessed through self-report, which may be subject to reporting bias.

From a nursing perspective, the findings highlight the role of community health nurses in occupational respiratory-health promotion. Nurses can provide education, demonstrate preventive measures and promote early recognition of respiratory symptoms among agricultural workers.

In conclusion, the study demonstrated a statistically significant short-term improvement in knowledge and preventive practices following a nurse-led teaching intervention. However, due to methodological limitations, the findings should be considered preliminary. Further studies using controlled designs, larger samples and longer follow-up are required to establish the effectiveness and sustainability of such interventions.

Limitations

1. The pre-experimental one-group pre-test–post-test design and absence of a control or comparison group limit causal interpretation of the observed changes. Testing effects, short-term recall, maturation and other external influences could not be completely excluded.

2. Purposive sampling and the relatively small sample of 60 participants may have introduced selection bias and limited the statistical power of subgroup and association analyses.
3. The study was conducted among crop and livestock handlers in selected rural areas of West Bengal; therefore, the findings may not be directly generalizable to agricultural workers in other geographical, cultural or occupational settings.
4. Preventive practices were assessed using a structured self-report measure and may therefore have been influenced by recall and social-desirability bias. The reported improvement should consequently be interpreted as a change in reported practices rather than objectively verified behavioural change.
5. The study assessed knowledge and preventive practices rather than clinical respiratory outcomes or confirmed ILD diagnosis. Therefore, the findings should not be interpreted as estimates of ILD prevalence, incidence or clinical disease status.
6. The post-test was conducted three days after the intervention, allowing assessment of short-term improvement but not long-term retention of knowledge or sustained behavioural modification.
7. Although the researcher-developed instruments underwent validity and reliability assessment, their use may limit direct comparison with studies using established standardized instruments.

Nursing Implications

Nursing Practice: Community health nurses can promote occupational respiratory health among crop and livestock handlers through structured education, counselling and practical demonstrations on respiratory hazards, exposure reduction, respiratory protection and early recognition of symptoms. Appropriate health-seeking and referral can also be encouraged.

Nursing Education: Occupational respiratory health can be incorporated into community health nursing education and field-based learning to prepare nursing students to identify agricultural respiratory hazards and provide culturally appropriate health education.

Nursing Administration: Nursing administrators can support the integration of occupational respiratory-health promotion into community health programmes by providing educational resources, demonstration materials and opportunities for interprofessional collaboration.

Nursing Research: The findings provide a basis for further nursing research using larger samples, stronger study designs, longer follow-up and objective outcome measures to evaluate sustained changes in occupational practices and respiratory health.

Recommendations

Based on the findings and limitations of the present study, the following recommendations are proposed:

1. Similar studies should be conducted with larger and more representative samples to improve the precision and generalizability of findings.
2. Randomized controlled trials and well-designed controlled quasi-experimental studies should be undertaken to provide stronger evidence regarding the causal effects of nurse-led occupational respiratory-health education.
3. Future investigations should include longer follow-up periods to determine whether improvements in knowledge and preventive practices are maintained.
4. Where appropriate and ethically feasible, future research should incorporate objective respiratory-health assessments alongside knowledge and behavioural measures.
5. Community-based respiratory-health screening and occupational-health education may be evaluated together to determine whether combined approaches improve early identification and referral of individuals with respiratory symptoms.
6. Similar interventions should be evaluated among other occupational groups exposed to organic dust, moulds, agricultural materials or animal-derived substances.
7. Future studies should incorporate measures of actual exposure-reduction behaviour and workplace practices rather than relying exclusively on self-reported preventive practices.
8. Comparative studies may examine different educational approaches, including individual counselling, group education, practical demonstrations, printed materials and digital health education.
9. Future research may assess the feasibility, acceptability, cost-effectiveness and sustainability of nurse-led occupational respiratory-health programmes within community health settings.

CONCLUSION

The present study demonstrated a statistically significant improvement in knowledge and preventive-practice scores following a nurse-led teaching intervention among crop and livestock handlers in selected rural areas of West Bengal.

The mean knowledge score increased from 12.75 ± 3.11 in the pre-test to 20.15 ± 2.88 in the post-test, representing a mean improvement of 7.40 points. The difference between the two measurements was statistically significant ($t=23.52$, $df=59$, $p<0.001$). The proportion of participants classified as having adequate knowledge increased from 8.3% before the intervention to 66.7% after the intervention.

The mean preventive-practice score similarly increased from 18.40 ± 4.32 to 26.60 ± 5.10 ,

representing a mean improvement of 8.20 points. The pre-test–post-test difference was statistically significant ($t=23.32$, $df=59$, $p<0.001$). The proportion of participants demonstrating good preventive practices increased from 5.0% to 50.0%. Taken together, these findings indicate substantial short-term improvement in the measured knowledge and preventive-practice outcomes following the nurse-led teaching programme. The findings suggest that structured occupational respiratory-health education may have practical value within community-based nursing practice for agricultural and livestock workers.

However, the findings should not be interpreted as definitive evidence that the intervention alone caused the observed improvements. The absence of a control group, purposive sampling, limited sample size, self-reported practice assessment and three-day follow-up restrict causal inference and generalizability.

The study therefore provides preliminary evidence supporting further investigation of nurse-led occupational respiratory-health education. Larger controlled studies incorporating longer follow-up and, where feasible, objective respiratory-health measures are recommended to establish the effectiveness and sustainability of such interventions.

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