Preplanned Studies

# Impact of Whole Lung Lavage on Pneumoconiosis Patients — China, 2018–2022

Yun Chen[1]; Xiangpei Lyu[1]; Tao Li[1]; Huanqiang Wang[1,#]


## Summary

### What is already known about this topic?

The application of whole lung lavage (WLL) for the clinical treatment of pneumoconiosis is prevalent in China. Several scholars have reported success in the treatment of early-stage pneumoconiosis. Nonetheless, the overall efficacy of WLL in the management of pneumoconiosis remains ambiguous.

### What is added by this report?

The preliminary evaluation of the effects of WLL on pneumoconiosis patients was conducted using follow-up data from 2020 to 2022, after controlling for confounding factors via propensity score matching. While the study found that WLL may improve some pneumoconiosis symptoms, no significant enhancements were observed in overall health status or quality of life.

### What are the implications for public health practice?

The findings of this research indicate limited efficacy of WLL in treating patients with pneumoconiosis, thereby suggesting that it should not be utilized as a standard treatment procedure for this condition.


Whole lung lavage (WLL) is a surgical procedure utilized in China to treat pneumoconiosis, despite the scholarly debate surrounding its efficacy. The National Institute for Occupational Health and Poisoning Control, part of the Chinese Center for Disease Control and Prevention (China CDC), conducted a comprehensive study on pneumoconiosis patients' health-seeking behaviors across 27 provincial-level administrative divisions (PLADs) over a three-year period, from January 2018 to December 2020. Utilizing baseline data, follow-up patient information, and WLL-related data, a retrospective cohort study was undertaken to evaluate WLL's impact and gauge the changes in pneumoconiosis-related symptoms and patient quality of life. The study, empowered by propensity score matching (PSM), contrasted 514 patients in both the control and lavage groups. The data illustrated that the patients in the lavage group displayed a marked improvement in expectoration symptoms and self-care than those in the control group. However, this study suggests that while WLL can alleviate some pneumoconiosis symptoms, it offers no significant enhancement to a patient's overall health status or quality of life.

The present study utilized data from a survey on health-seeking behaviors and a subsequent follow-up survey of pneumoconiosis patients across 27 PLADs in China. The investigation was conducted by the National Institute for Occupational Health and Poisoning Control, affiliated with China CDC (*1*).

The initial health-seeking behavior survey, undertaken from January 2018 to December 2020, involved studying 9,934 pneumoconiosis patients. Of these, 8,198 valid questionnaires were collected, resulting in a questionnaire recovery rate of 82.5%.

The research group subsequently executed a second telephone follow-up survey from 2020 to 2022. This included the 8,198 pneumoconiosis patients from the initial survey. As of November 2022, follow-up communication had been completed with 5,561 patients. However, the remaining 2,637 patients, who were still being followed up, were not included in the current study due to timing constraints.

The follow-up survey amassed a total of 4,644 valid questionnaires, yielding a questionnaire recovery rate of 83.5%. Tragically, the survey revealed that 232 pneumoconiosis patients passed away during the second follow-up.

The current study finally selected 514 cases, both from the control group (those who had not received WLL treatment prior to the first survey) and the lavage group (those who had received WLL treatment prior to the first survey). A PSM technique was used to match the baseline data from the first survey of 4,412 surviving pneumoconiosis patients with valid questionnaires; 3,322 did not receive WLL before the first survey, and 1,090 received WLL before the first survey (Figure 1).

This study utilized PSM to create control and lavage

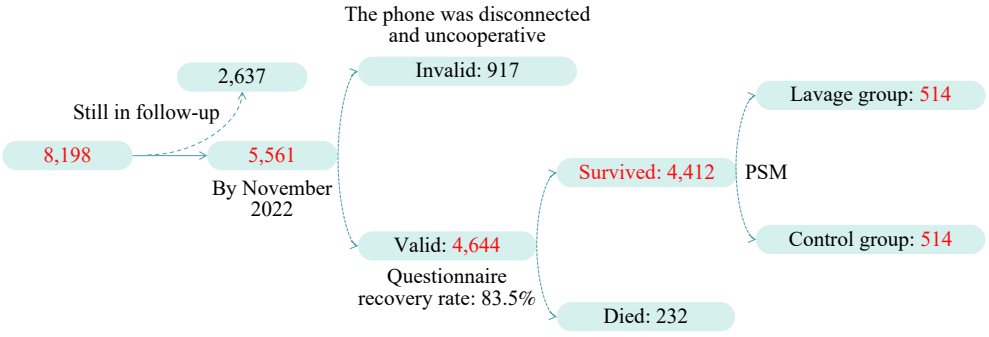


FIGURE 1. Flowchart of enrolled patients.
Abbreviation: PSM=propensity score matching.

groups from the pool of surveyed pneumoconiosis patients in each medical institution. The final control and lavage groups each included 514 patients. Factors used for matching consisted of gender, age, body mass index (BMI), patients' source, annual family income, pneumoconiosis stage and type, presence of tuberculosis, self-reported health status, medications for pneumoconiosis, oxygen therapy, and practice of breathing exercises, all of which are crucial influencers on pneumoconiosis patients' decision to undergo WLL and their overall health condition. The Nearest Neighbor Matching method was applied in a 1∶1 matching ratio with a caliper value of 0.01. The basic information of the two groups of patients is shown in Supplementary Tables S1–S2 (available in https://weekly.chinacdc.cn/). The study referenced the European EQ-5D-3L scale to describe patient quality of life. To compare pneumoconiosis-related symptoms and quality of life differences between the two groups, the *t*-test, chi-squared test or Fisher's exact probability method was implemented, while paired *t*-test and paired chi-squared test were used to assess differences between initial and follow-up surveys for both groups. All analyses used SPSS software (version 26.0, SPSS Inc, Chicago, IL, USA). The accepted statistically significant level was set at 0.05 (two-tailed)。 Ethical approval for this research was granted by the Ethics Committee of the National Institute for Occupational Health and Poison Control, China CDC (Approval No: 201720). Written informed consent was obtained from all participants.

Following PSM, a total of 514 patients were found in each of the control group and the lavage group. The average age in both groups was found to be 53.3 years, with a standard deviation of 9.7 and 8.3, respectively, a difference which was not considered statistically significant ($t$=–0.052, $P$=0.959). The average interval between the two surveys was found to be approximately 1.9 years in both groups, with a standard deviation of 0.9 and 0.8, respectively, revealing no significant statistical difference ($t$=0.799, $P$=0.424).

In the initial survey, a notable statistical difference was detected regarding expectoration symptoms between the two groups ($P$<0.001). The percentage of patients exhibiting no expectoration was lower in the lavage group than in the control group (11.7% *vs.* 19.8%). Conversely, the patient percentage with minimal expectoration was higher than in the control group (62.8% *vs.* 54.5%). However, in the subsequent follow-up survey, no meaningful difference in expectoration symptoms was found between the groups ($P$=0.606) (Table 1).

A comparative analysis of pneumoconiosis symptoms before and after the initial and follow-up surveys indicates a significant statistical variation in the severity of the identified eight symptoms across the two groups ($P$<0.05). We noted a reduction in the proportion of patients in the highest severity level of each symptom and conversely, observed an increased proportion of patients without the said symptoms in both groups (Supplementary Table S3, available in https://weekly.chinacdc.cn/).

The initial and subsequent surveys did not reveal any statistically significant disparities in the five elements of self-reported quality of life and health status among pneumoconiosis patients across both groups ($P$>0.05) (Supplementary Table S4, available in https://weekly.chinacdc.cn/).

Upon comparing the quality of life before and after initial and follow-up surveys, no statistically significant changes were observed in the self-care of pneumoconiosis patients from the control group ($P$=0.083). Conversely, the differences within the lavage group were statistically significant ($P$<0.001), exemplified by an increased proportion of patients

TABLE 1. Comparison of pneumoconiosis-related symptoms between the control group and the lavage group — China, 2018–2022 (*n*=514).

| Symptoms | The first survey | | | | Secondary follow-up survey | | | |
|---|---|---|---|---|---|---|---|---|
| | Control group *n* (%) | Lavage group *n* (%) | $\chi^2$ | *P* | Control group *n* (%) | Lavage group *n* (%) | $\chi^2$ | *P* |
| Cough | | | 2.079 | 0.354 | | | 4.265 | 0.119 |
| No | 51 (9.9) | 38 (7.4) | | | 113 (22.0) | 135 (26.3) | | |
| Mild | 310 (60.3) | 319 (62.1) | | | 313 (60.9) | 310 (60.3) | | |
| Moderate and severe | 153 (29.8) | 157 (30.5) | | | 88 (17.1) | 69 (13.4) | | |
| Expectoration | | | 13.959 | <0.001 | | | 1.003 | 0.606 |
| No | 102 (19.8) | 60 (11.7) | | | 166 (32.3) | 181 (35.2) | | |
| Mild | 280 (54.5) | 323 (62.8) | | | 270 (52.5) | 260 (50.6) | | |
| Moderate and severe | 132 (25.7) | 131 (25.5) | | | 78 (15.2) | 73 (14.2) | | |
| Chest tightness | | | 2.661 | 0.264 | | | 0.255 | 0.880 |
| No | 64 (12.5) | 48 (9.3) | | | 164 (31.9) | 157 (30.5) | | |
| Mild | 295 (57.4) | 310 (60.3) | | | 258 (50.2) | 261 (50.8) | | |
| Moderate and severe | 155 (30.2) | 156 (30.4) | | | 92 (17.9) | 96 (18.7) | | |
| Chest pain | | | 5.736 | 0.057 | | | 4.578 | 0.101 |
| No | 199 (38.7) | 170 (33.1) | | | 336 (65.4) | 329 (64.0) | | |
| Mild | 197 (38.3) | 234 (45.5) | | | 118 (23.0) | 141 (27.4) | | |
| Moderate and severe | 118 (23.0) | 110 (21.4) | | | 60 (11.7) | 44 (8.6) | | |
| Dyspnea | | | 0.439 | 0.803 | | | 4.370 | 0.112 |
| No | 131 (25.5) | 129 (25.1) | | | 176 (34.2) | 208 (40.5) | | |
| Mild | 222 (43.2) | 232 (45.1) | | | 230 (44.7) | 212 (41.2) | | |
| Moderate and severe | 161 (31.3) | 153 (29.8) | | | 108 (21.0) | 94 (18.3) | | |
| Hemoptysis | | | 0.957 | 0.328 | | | 0.324 | 0.569 |
| No | 460 (89.5) | 450 (87.5) | | | 486 (94.6) | 490 (95.3) | | |
| Yes | 54 (10.5) | 64 (12.5) | | | 28 (5.4) | 24 (4.7) | | |

Note: The categories for cough severity include mild (intermittent cough not affecting daily activities), moderate, and severe (frequent or violent cough disrupting daily activities and rest). Expectoration is categorized as mild (sputum volume of 10–50 mL during day and night), moderate, and severe (sputum volume exceeding 50 mL during day and night). Chest tightness ranges from mild (intermittent discomfort) to moderate and severe (persistent tightness restricting breathing). Chest pain and dyspnea are classified as mild (occurs during physical activities), moderate, and severe (manifests during daily activities and rest).

reported to have "no problem" in terms of self-care (Table 2). The average variation in self-reported health status between the two surveys was 9.6±16.7 in the control group and 10.3±18.5 in the lavage group. This difference, however, did not reach statistical significance ($t$=−0.678, $P$=0.498).

## DISCUSSION

This research involved the selection of lavage and control groups through PSM for the purpose of comparing differences in pneumoconiosis-related symptoms and quality of life. These two groups of pneumoconiosis patients exhibited similar baseline characteristics, allowing for a preliminary evaluation of the effects of WLL on these patients. The intent was to stimulate thought and inform future empirical studies focusing on the long-term efficacy of WLL for pneumoconiosis patients. The Consensus of Chinese Experts on Pneumoconiosis Treatment (2018) purports that while WLL significantly improves clinical symptoms in the short term, current evidence does not substantiate a marked therapeutic impact on lung function and pulmonary fibrosis. As WLL is an invasive treatment, it is currently not upheld as a standard treatment for pneumoconiosis (*2*). The results from the study's initial survey are presented herewith.

The survey data revealed a 17.8% prevalence rate for WLL use among participants, signaling its considerable utilization as a nonstandard treatment technique. Earlier studies typically gauged the efficacy of WLL via self-regulated pre-and post-surgical evaluations, concluding that WLL might have a positive impact on alleviating short-term pneumoconiosis symptoms

TABLE 2. Comparative analysis of quality-of-life differences between the two patient groups across two surveys — China, 2018–2022 (*n*=514).

| Quality of life | Group | Level | The first survey | Secondary follow-up survey | *P* |
|---|---|---|---|---|---|
| Mobility, *n* (%) | Control group | No problems | 302 (58.8) | 365 (71.0) | <0.001 |
| | | Moderate problems | 206 (40.1) | 140 (27.2) | |
| | | Extreme problems | 6 (1.2) | 9 (1.8) | |
| | Lavage group | No problems | 322 (62.6) | 388 (75.5) | <0.001 |
| | | Moderate problems | 189 (36.8) | 123 (23.9) | |
| | | Extreme problems | 3 (0.6) | 3 (0.6) | |
| Self-care, *n* (%) | Control group | No problems | 405 (78.8) | 426 (82.9) | 0.083 |
| | | Moderate problems | 106 (20.6) | 82 (16.0) | |
| | | Extreme problems | 3 (0.6) | 6 (1.2) | |
| | Lavage group | No problems | 386 (75.1) | 442 (86.0) | <0.001 |
| | | Moderate problems | 125 (24.3) | 70 (13.6) | |
| | | Extreme problems | 3 (0.6) | 2 (0.4) | |
| Usual activities, *n* (%) | Control group | No problems | 251 (48.8) | 317 (61.7) | <0.001 |
| | | Moderate problems | 232 (45.1) | 173 (33.7) | |
| | | Extreme problems | 31 (6.0) | 24 (4.7) | |
| | Lavage group | No problems | 264 (51.4) | 349 (67.9) | <0.001 |
| | | Moderate problems | 221 (43.0) | 143 (27.8) | |
| | | Extreme problems | 29 (5.6) | 22 (4.3) | |
| Pain/discomfort, *n* (%) | Control group | No problems | 118 (23.0) | 233 (45.3) | <0.001 |
| | | Moderate problems | 352 (68.5) | 255 (49.6) | |
| | | Extreme problems | 44 (8.6) | 26 (5.1) | |
| | Lavage group | No problems | 147 (28.6) | 234 (45.5) | <0.001 |
| | | Moderate problems | 330 (64.2) | 268 (52.1) | |
| | | Extreme problems | 37 (7.2) | 12 (2.3) | |
| Anxiety/depression, *n* (%) | Control group | No problems | 219 (42.6) | 292 (56.8) | <0.001 |
| | | Moderate problems | 214 (41.6) | 193 (37.5) | |
| | | Extreme problems | 81 (15.8) | 29 (5.6) | |
| | Lavage group | No problems | 217 (42.2) | 313 (60.9) | <0.001 |
| | | Moderate problems | 210 (40.9) | 176 (34.2) | |
| | | Extreme problems | 87 (16.9) | 25 (4.9) | |
| Health status self-score ($\bar{x} \pm s$) | Control group | / | 59.1±17.3 | 68.7±15.8 | <0.001 |
| | Lavage group | / | 59.0±17.2 | 69.3±16.3 | <0.001 |

Note: "/" means health status self-score did not differentiate levels.

(*3*–*4*). Nonetheless, the present research suggests that both patient groups exhibited improved health status. This improvement may be attributable to recent enhancements in national support policies for individuals with pneumoconiosis and the survivor effect (*5*–*6*). Therefore, when assessing WLL's impact on pneumoconiosis patients, mere self-comparisons before and after the treatment may not accurately reflect the reality of their condition.

In studies involving control groups, the influential confounding factors affecting the health condition of patients with pneumoconiosis were either not adjusted or only a few were accounted for. Despite this, these studies generally concluded that WLL had short-term beneficial effects on the patients' health (*7*–*8*). Before adjusting for confounders, WLL was linked to improvements in numerous respiratory symptoms and quality of life. WLL typically targets patients with relatively mild conditions that are more likely to tolerate the procedure, introducing potential selection bias in the outcomes (*9*–*10*). In our study, however, we employed a large sample size and controlled for the principal factors that may influence both the patients' decision to undergo WLL and their health conditions.

Using PSM, we equalized the baseline characteristics of both patient groups. This approach allowed us to evaluate the effects of WLL on pneumoconiosis patients more accurately.

The findings of the study indicate that WLL yielded a moderate effect on alleviating expectoration symptoms when juxtaposed with the control. However, there was no significant improvement in symptoms such as coughing, chest tightness, chest pain, and dyspnea in comparison to the control. This finding is consistent with the underlying mechanism that WLL works by cleansing the respiratory tract and pulmonary sputum of patients with pneumoconiosis, thus aiding those with substantial sputum stasis that is challenging to expectorate. In terms of quality of life assessment, WLL only significantly enhanced the self-care abilities of the pneumoconiosis patients contrasted with the control. However, no notable improvements were evident in the remaining four aspects and the overall health status compared with the control group.

This study indicates that WLL has a modest impact on pneumoconiosis patients and should not be considered a standard treatment. However, this research primarily assessed the influence of whole lung lavage based on patients' subjective experiences of symptoms and quality of life, without incorporating objective measurements, such as chest imaging and lung function. This omission represents a limitation. Future research on the use of WLL in pneumoconiosis treatment should endeavor to provide stronger evidence by choosing indicators that can objectively assess disease severity, progression, and patient quality of life. It should also account for potential confounding factors, such as the quality of WLL operation, patients' dust exposure history, medication therapies, and other treatment modalities. A systematic evaluation of WLL's long-term efficacy using standardized methodologies is recommended to fairly assess WLL's cost-effectiveness for pneumoconiosis patients.

The current study inadequately addresses the potential influence of varied WLL procedure quality across different medical institutions on patient outcomes. Furthermore, the research does not provide detailed information regarding the dust exposure history and work type of participants, likely influencing the assessed impact of WLL on pneumoconiosis patients. Additionally, potential disparities in data collection methods could introduce bias as the initial questionnaire involved face-to-face interviews, whereas the secondary follow-up predominantly used telephone interviews. Consequently, the potential for information bias is apparent in the comparison of the two surveys' results.

**Conflicts of interest**: No conflicts of interest.

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[#] Corresponding author: Huanqiang Wang, wanghq@niohp.chinacdc.cn.

[1] National Institute of Occupational Health and Poison Control, Chinese Center for Disease Control and Prevention, Beijing, China.

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# SUPPLEMENTARY MATERIALS

SUPPLEMENTARY TABLE S1. Comparison of demographic and sociological characteristics between control and lavage groups in pneumoconiosis patients (*n*=514).

| Demographic and sociological characteristics | Control group, *n* (%) | Lavage group, *n* (%) | $\chi^2$ | *P* |
|---|---|---|---|---|
| Sex | | | 0.609 | 0.435 |
| Male | 508 (98.8) | 505 (98.2) | | |
| Female | 6 (1.2) | 9 (1.8) | | |
| Age, years | | | 5.320 | 0.150 |
| ≤40 | 41 (8.0) | 26 (5.1) | | |
| 41–50 | 169 (32.9) | 166 (32.3) | | |
| 51–60 | 194 (37.7) | 220 (42.8) | | |
| >60 | 110 (21.4) | 102 (19.8) | | |
| BMI | | | 0.888 | 0.828 |
| <18.5 | 25 (4.9) | 23 (4.5) | | |
| 18.5–23.9 | 248 (48.2) | 239 (46.5) | | |
| 24–27.9 | 193 (37.5) | 196 (38.1) | | |
| ≥28 | 48 (9.3) | 56 (10.9) | | |
| Marital status | | | 3.772 | 0.438 |
| Married | 482 (93.8) | 485 (94.4) | | |
| Divorced | 9 (1.8) | 8 (1.6) | | |
| Widowed | 13 (2.5) | 14 (2.7) | | |
| Single | 10 (1.9) | 5 (1.0) | | |
| Others | 0 (0.0) | 2 (0.4) | | |
| Educational level | | | 0.995 | 0.910 |
| Illiterate or semiliterate | 23 (4.5) | 22 (4.3) | | |
| Primary school | 182 (35.4) | 190 (37.0) | | |
| Middle school | 230 (44.7) | 223 (43.4) | | |
| High school or junior college or above | 75 (14.6) | 77 (15.0) | | |
| Others | 4 (0.8) | 2 (0.4) | | |
| District | | | / | 1.000* |
| Eastern region | 246 (47.9) | 246 (47.9) | | |
| Central region | 98 (19.1) | 98 (19.1) | | |
| Western region | 168 (32.7) | 168 (32.7) | | |
| Northeastern region | 2 (0.4) | 2 (0.4) | | |
| Source of cases | | | 5.780 | 0.123 |
| Household investigation | 46 (8.9) | 59 (11.5) | | |
| Outpatient | 174 (33.9) | 146 (28.4) | | |
| Hospitalized | 243 (47.3) | 266 (51.8) | | |
| Occupational health examination | 51 (9.9) | 43 (8.4) | | |

Note: "/" means Fisher exact probability method does not give chi-square values.
Abbreviation: BMI=body mass index.
* Fisher exact probability method was used for statistics.

SUPPLEMENTARY TABLE S2. Comparison of pneumoconiosis and complications between the control group and the lavage group (*n*=514).

| Pneumoconiosis and complications | Control group, *n* (%) | Lavage group, *n* (%) | $\chi^2$ | *P* |
|---|---|---|---|---|
| Stage of pneumoconiosis | | | 6.780 | 0.079 |
| Stage I | 247 (48.1) | 218 (42.4) | | |
| Stage II | 112 (21.8) | 146 (28.4) | | |
| Stage III | 115 (22.4) | 116 (22.6) | | |
| Unstaged clinical diagnosis | 40 (7.8) | 34 (6.6) | | |
| Type of pneumoconiosis | | | 0.017 | 0.992 |
| Silicosis | 238 (46.3) | 238 (46.3) | | |
| Coal worker's pneumoconiosis | 242 (47.1) | 243 (47.3) | | |
| Others | 34 (6.6) | 33 (6.4) | | |
| Complications | | | | |
| PTB | | | 0.275 | 0.600 |
| No | 481 (93.6) | 485 (94.4) | | |
| Yes | 33 (6.4) | 29 (5.6) | | |
| Pulmonary heart disease | | | 0.157 | 0.692 |
| No | 485 (94.4) | 482 (93.8) | | |
| Yes | 29 (5.6) | 32 (6.2) | | |
| Pulmonary bullae or pneumothorax | | | 0.285 | 0.594 |
| No | 463 (90.1) | 468 (91.1) | | |
| Yes | 51 (9.9) | 46 (8.9) | | |
| Lung cancer or mesothelioma | | | / | 1.000* |
| No | 513 (99.8) | 513 (99.8) | | |
| Yes | 1 (0.2) | 1 (0.2) | | |

Note: "/" means Fisher exact probability method does not give chi-square values.
Abbreviation: PTB=pulmonary tuberculosis.
* Fisher exact probability method was used for statistics.

SUPPLEMENTARY TABLE S3. Comparison of pneumoconiosis-related symptoms between patients in two survey groups (*n*=514).

| Symptoms | Group | Level | The first survey *n* (%) | Secondary follow-up survey *n* (%) | *P* |
|---|---|---|---|---|---|
| Cough | Control group | No | 51 (9.9) | 113 (22.0) | <0.001 |
| | | Mild | 310 (60.3) | 313 (60.9) | |
| | | Moderate and severe | 153 (29.8) | 88 (17.1) | |
| | Lavage group | No | 38 (7.4) | 135 (26.3) | <0.001 |
| | | Mild | 319 (62.1) | 310 (60.3) | |
| | | Moderate and severe | 157 (30.5) | 69 (13.4) | |
| Expectoration | Control group | No | 102 (19.8) | 166 (32.3) | <0.001 |
| | | Mild | 280 (54.5) | 270 (52.5) | |
| | | Moderate and severe | 132 (25.7) | 78 (15.2) | |
| | Lavage group | No | 60 (11.7) | 181 (35.2) | <0.001 |
| | | Mild | 323 (62.8) | 260 (50.6) | |
| | | Moderate and severe | 131 (25.5) | 73 (14.2) | |
| Chest tightness | Control group | No | 64 (12.5) | 164 (31.9) | <0.001 |
| | | Mild | 295 (57.4) | 258 (50.2) | |
| | | Moderate and severe | 155 (30.2) | 92 (17.9) | |
| | Lavage group | No | 48 (9.3) | 157 (30.5) | <0.001 |
| | | Mild | 310 (60.3) | 261 (50.8) | |
| | | Moderate and severe | 156 (30.4) | 96 (18.7) | |
| Chest pain | Control group | No | 199 (38.7) | 336 (65.4) | <0.001 |
| | | Mild | 197 (38.3) | 118 (23.0) | |
| | | Moderate and severe | 118 (23.0) | 60 (11.7) | |
| | Lavage group | No | 170 (33.1) | 329 (64.0) | <0.001 |
| | | Mild | 234 (45.5) | 141 (27.4) | |
| | | Moderate and severe | 110 (21.4) | 44 (8.6) | |
| Dyspnea | Control group | No | 131 (25.5) | 176 (34.2) | <0.001 |
| | | Mild | 222 (43.2) | 230 (44.7) | |
| | | Moderate and severe | 161 (31.3) | 108 (21.0) | |
| | Lavage group | No | 129 (25.1) | 208 (40.5) | <0.001 |
| | | Mild | 232 (45.1) | 212 (41.2) | |
| | | Moderate and severe | 153 (29.8) | 94 (18.3) | |
| Hemoptysis | Control group | No | 460 (89.5) | 486 (94.6) | 0.002 |
| | | Yes | 54 (10.5) | 28 (5.4) | |
| | Lavage group | No | 450 (87.5) | 490 (95.3) | <0.001 |
| | | Yes | 64 (12.5) | 24 (4.7) | |

SUPPLEMENTARY TABLE S4. Comparison of quality of life between the control group and the lavage group (*n*=514).

| Quality of life | The first survey | | | | Secondary follow-up survey | | | |
|---|---|---|---|---|---|---|---|---|
| | Control group | Lavage group | $\chi^2/t$ | *P* | Control group | Lavage group | $\chi^2/t$ | *P* |
| Mobility, *n* (%) | | | / | 0.325* | | | 4.801 | 0.091 |
| No problems | 302 (58.8) | 322 (62.6) | | | 365 (70.1) | 388 (75.5) | | |
| Moderate problems | 206 (40.1) | 189 (36.8) | | | 140 (27.2) | 123 (23.9) | | |
| Extreme problems | 6 (1.2) | 3 (0.6) | | | 9 (1.8) | 3 (0.6) | | |
| Self-care, *n* (%) | | | / | 0.375* | | | / | 0.198* |
| No problems | 405 (78.8) | 386 (75.1) | | | 426 (82.9) | 442 (86.0) | | |
| Moderate problems | 106 (20.6) | 125 (24.3) | | | 82 (16.0) | 70 (13.6) | | |
| Extreme problems | 3 (0.6) | 3 (0.6) | | | 6 (1.2) | 2 (0.4) | | |
| Usual activities, *n* (%) | | | 0.662 | 0.718 | | | 4.473 | 0.107 |
| No problems | 251 (48.8) | 264 (51.4) | | | 317 (61.7) | 349 (67.9) | | |
| Moderate problems | 232 (45.1) | 221 (43.0) | | | 173 (33.7) | 143 (27.8) | | |
| Extreme problems | 31 (6.0) | 29 (5.6) | | | 24 (4.7) | 22 (4.3) | | |
| Pain/discomfort, *n* (%) | | | 4.488 | 0.106 | | | 5.483 | 0.063 |
| No problems | 118 (23.0) | 147 (28.6) | | | 233 (45.3) | 234 (45.5) | | |
| Moderate problems | 352 (68.5) | 330 (64.2) | | | 255 (49.6) | 268 (52.1) | | |
| Extreme problems | 44 (8.6) | 37 (7.2) | | | 26 (5.1) | 12 (2.3) | | |
| Anxiety/depression, *n* (%) | | | 0.261 | 0.878 | | | 1.808 | 0.409 |
| No problems | 219 (42.6) | 217 (42.2) | | | 292 (56.8) | 313 (60.9) | | |
| Moderate problems | 214 (41.6) | 210 (40.9) | | | 193 (37.5) | 176 (34.2) | | |
| Extreme problems | 81 (15.8) | 87 (16.9) | | | 29 (5.6) | 25 (4.9) | | |
| Health status self-score ($\bar{x} \pm s$) | (59.11±17.3) | (59.0±17.2) | 0.092 | 0.927 | (68.7±15.8) | (69.3±16.3) | −0.644 | 0.520 |

Note: "/" means Fisher exact probability method does not give chi-square values.
Abbreviation: PTB=pulmonary tuberculosis.
* Fisher exact probability method was used for statistics.