Integrating Silicosis Care into Primary Health Systems: A Framework for High Burden Areas of Rajasthan

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1.Introduction

Silicosis is a progressive, irreversible occupational lung disease caused by inhalation of crystalline silica dust. It disproportionately affects workers in mining, stone crushing, and related industries. Tribal and rural regions like Southern Rajasthan where a large population is involved in such work are worst hit by Silicosis which contributes to significant morbidity, increases vulnerability to tuberculosis (TB), and leads to early mortality, often in economically productive age groups. In resource-constrained settings, the primary health care (PHC) system must be capacitated to provide comprehensive care and surveillance for silicosis as it provides the opportunity for an early diagnosis and better continuity of care which is crucial in case of Silicosis.

This document has recommendation and framework for a **PHC-level prevention, diagnosis, clinical care, and linkage to welfare schemes** for silicosis-affected individuals with suitable monitoring strategies.

2. Objectives

The integrated services for silicosis at primary level will have following objectives-

1. Early identification and diagnosis of Silicosis in primary care.
2. Integration of Silicosis and TB care within PHC systems.
3. Symptom management and palliative care for affected individuals.
4. Nutritional and social support through government schemes.
5. Systematic referral mechanisms for advanced care.
6. Community awareness and occupational risk reduction.
7. Ensure accountability of the PHCs for documentation and preventive work.
8. Mental health support for affected individuals and caregivers, including counselling and interventions for smoking and alcohol cessation.

3. PHC-Based Silicosis Management

The PHC-based management of silicosis must include relevant history documenting the nature of occupation and establishing exposure, screening for co-morbidities (e.g TB, Diabetes etc.) and primary management of respiratory distress with commonly available drugs. Primary services must extend to provide basic palliative services given the incurable nature of Silicosis. A brief outline of various essential components of care for silicosis is given in the following table.

Section	Components	Details to capture
A. Case Identification and History-Taking	Occupational History	• Age at first exposure, • Years of work, • Nature(type) of work • Source of exposure (type of stone) • Tools used, • Protective gear availability
	Migration History	• Patterns of migration, • Worksite conditions, • Employer details
	Symptom History	• Chronic cough, • Breathlessness, • Chest pain, • Fatigue, • Haemoptysis etc
	Comorbidities & TB History	• Previous TB treatment, • Household TB exposure • Pre-existing mental illness • Signs of mental distress and disorder. • Other co-morbidities- e.g. Diabetes, hypertension.
	Nutrition & Personal History	• Anthropometry, • Smoking/alcohol use, • Family history
B. Clinical Evaluation and Diagnostics	Identification Criteria	• History of dust exposure + persistent respiratory symptoms, • Chest X-ray
	Symptom Management	• Inhaled bronchodilators (Salbutamol, Ipratropium, budesonide) • Oral agents (Deriphyllin, Prednisolone), Cough suppressants
	Screening for Comorbidities	• TB (CBNAAT, sputum AFB, X-ray), • Diabetes (FBS, RBS)
	Nutritional Assessment & Support	• Height, weight, BMI;

		• Link to social welfare Schemes
C. Palliative Care for Advanced Silicosis	Pain Management	Tramadol (oral and parenteral) or other Morphine analogues
	Home-Based Oxygen Therapy	Oxygen concentrators or cylinders
	Home Care Planning	Multidisciplinary plan with community health workers (CHWs) and HWCs
	Recreational support	Home- based recreational activities (e.g.- reading, chest exercises, videos on mental health support, engaging in patient support groups)
E. Prevention and Family Screening	Mask Provision	N95 or other protective equipment to patients
	Family Screening	Screen family with similar exposure history
	Community Awareness	Regular awareness sessions on occupational risks

4. Resource Recommendations

A. Essential Drug Stocking at PHC

Category	Drugs
Respiratory support	Salbutamol, Ipratropium, Budecort inhalers
Emergency use	Nebulized bronchodilators, oral corticosteroids
General	Paracetamol, NSAIDs, Tramadol (morphine-analogues), cough syrups, nutritional supplements, IFA, multivitamins
Anti-TB	As per NTEP

B. Essential Equipment

- Nebulisers and Spacers
- Weighing machine, stadiometer
- BP apparatus, thermometer, stethoscope
- Pulse oximeters, oxygen concentrators (minimum 2 per PHC)
- Emergency oxygen cylinders

- Microscope for Sputum ZN stain
- Transport equipment for Sputum CBNAAT – Falcon tubes, containers, carrier box.
- Portable X-ray (if fixed unit not feasible)

5. Capacity Building and Human Resources

Strengthening the skills and knowledge of Primary Health Centre (PHC) staff is central to ensuring effective identification, management, and prevention of silicosis at the community level. The proposed capacity building framework will focus on equipping healthcare providers with both clinical and community-oriented competencies required in high-risk regions.

a. Occupational Health and Early Recognition of Silicosis

Training should emphasise the occupational risk factors for silicosis, including types of industries, work processes, and patterns of exposure in mining and stone crushing. PHC staff should be trained to take detailed occupational histories, identify early respiratory symptoms, and interpret basic chest radiography findings. This will enable timely suspicion and initiation of the diagnostic process.

b. Training in ILO Classification for Radiograph Interpretation

Medical Officers (MOs) should be trained in the International Labour Organization (ILO) classification system for pneumoconiosis to enhance their ability to interpret chest radiographs for suspected silicosis cases. This training will standardize reporting, improve diagnostic accuracy, and facilitate consistency in surveillance data. The module should include hands-on practice with a range of sample radiographs, guidance on differentiating silicosis patterns from other lung pathologies, and use of ILO standard reference films. Such skill-building will also strengthen medico-legal documentation for compensation claims and align PHC-level diagnosis with state and national reporting frameworks.

c. TB Co-Management in Silicosis Patients

Given the strong association between silicosis and tuberculosis, staff should be trained in integrated screening protocols, use of diagnostic tools like CBNAAT, and appropriate management pathways as per the National TB Elimination Programme (NTEP). This should include counselling patients on adherence, monitoring for drug side effects, and preventing transmission within households.

d. Basics of Palliative Care and Home-Based Oxygen Therapy

All nurses and Medical Officers at PHCs should receive basic palliative care training, enabling them to provide primary-level symptom relief and psychosocial support before referral. Training should cover symptom relief for advanced silicosis, including the safe use of inhalers, pain management, and palliative interventions such as morphine analogues. PHC staff should learn to assess oxygen needs, operate and maintain oxygen concentrators, and provide guidance to families on safe use at home.

e. Nutritional Assessment and Referrals

Nutritional deficits worsen outcomes in silicosis and TB. Staff should be trained in anthropometric measurements, BMI calculation, and identification of undernutrition. They should also be guided on linking eligible patients to government nutrition schemes such as Nikshay-POSHAN, Take Home Rations, PDS, or State-specific silicosis welfare packages.

f. Community Awareness Strategies and IEC Tools

PHC teams should be trained to develop and deliver culturally appropriate awareness sessions on occupational hazards, dust control measures, and the importance of protective gears. They will also learn to use Information, Education, and Communication (IEC) tools effectively during camps, OPD visits, and community meetings.

6. Referral and Escalation Protocols

Patients should be referred to higher centers like CHC, District Hospitals, or Tertiary Centers under the following conditions:

a. **Hypoxia unresponsive to initial therapy**: If oxygen saturation (SpO_2) remains <90% despite appropriate oxygen and initial management, transfer is required, ensuring oxygen therapy continues during transport.
b. **Massive haemoptysis or repeated exacerbations:** Refer urgently in cases of severe or recurrent blood loss (>100mL/hr or >500mL/24hr), unstable vitals, respiratory distress, or failure to respond to initial stabilization. Early communication and coordination for definitive management (ICU, pulmonology, interventional radiology, surgery) are vital.
c. **Need for advanced palliative care**: Patients requiring complex symptom management, psychosocial or end-of-life care, and supportive services should be referred using standardized criteria and trigger tools for early intervention. This should be coordinated with the district medical colleges/higher centers where palliative care is available.
d. **Treatment of co-morbidities:** Complex cases (e.g. cardiac, metabolic, renal or infectious) surpassing PHC's treatment capacity should be referred for multidisciplinary advanced care and comprehensive management.
e. **Telemedicine support for advanced diseases**: For patients with advanced or complicated conditions where immediate transfer is not feasible, teleconsultation with specialists at higher

centers should be initiated. This ensures timely expert guidance for stabilization, rational use of local resources, and planning for safe referral when appropriate.

7. Establishing Referral Feedback Loops

a. **Closed-loop referral system**: The referring provider sends complete documentation, contacts the receiving center, and gets feedback on referral status, progress, and outcomes—thus ensuring continuity and minimizing errors or missed follow-ups.
b. **Referrals should be documented**, including the patient's final diagnosis, treatment plan, and recommendations for ongoing care.
c. Care-plans should explicitly schedule **follow-up appointments** and clarify ongoing responsibilities at both sites, reducing gaps and "referral leakage."

8. Health System Strengthening and Integration

A. Administrative Measures

a. A **Silicosis and TB Suspect Registry** should be maintained at every PHC to systematically record all individuals with suspected occupational lung disease or TB. This registry should be updated monthly and should serve as a tool for tracking diagnosis, treatment, and follow-up.

b. A **death registry** for suspected silicosis cases should be maintained at PHC level. Whenever feasible, verbal autopsy or post-mortem should be conducted to confirm cause of death and feed into surveillance data, improving accuracy in disease burden estimation.

c. PHCs should facilitate **on-site application for the State Silicosis Relief Schemes**, including assistance with medical certification and processing of compensation claims. This should be patient-friendly, reducing the need for multiple visits to higher centres.

B. Community-Based Interventions

a. Community Health Officers (CHOs), Auxiliary Nurse Midwives (ANMs), Accredited Social Health Activists (ASHAs), and local health workers should be actively involved in **patient follow-up**, household counselling, and monitoring of treatment adherence. Their close link

with the community should be leveraged to identify new cases early and provide psychosocial support.

b. **Quarterly screening camps** should be organised in high-risk mining and stone-crushing areas. These camps should include respiratory check-ups, TB screening, and occupational health education sessions.

c. PHC Medical Officers should participate in **industrial site visits** and inspections to promote dust control measures, ensure use of personal protective equipment (PPE), and collaborate with labour and industry departments for enforcement of occupational safety standards.

9. Monitoring of the services-

Component	Details	Frequency	Responsible Personnel	Data Source / Tool
Monthly Reporting	Number of suspected, confirmed, referred, and deceased silicosis cases	Monthly	PHC Medical Officer, Data Entry Operator (DEO)	PHC Silicosis & TB Registry, Monthly PHC Report
Indicator 1	Number of TB–silicosis co-diagnoses	Monthly	PHC Medical Officer	TB Laboratory Register, CBNAAT Reports, Silicosis Case Sheets
Indicator 2	Number of referrals/linkages for nutritional support	Monthly	PHC MO, CHO	Social Welfare Referral Forms, Nutrition Scheme Beneficiary List
Indicator 3	Number of patients provided home oxygen therapy	Monthly	PHC MO, CHO	Oxygen Therapy Logbook
Indicator 4	Number of patients facilitated for compensation under State Silicosis Relief Scheme	Quarterly	DEO, Social Welfare Link Worker(?)	Compensation Application Records
Audit Tool 1	Patient registers updated and maintained	Quarterly	PHC MO, Data Entry Operator	PHC Patient Registers
Audit Tool 2	Follow-up visit logs completed	Quarterly	ASHA, ANM, CHO	Home Visit Register, Follow-up Log
Audit Tool 3	Staff training attendance recorded	Annually	PHC In-charge	Training Attendance Sheet
Audit Tool 4	Availability of essential drugs and equipment	Monthly	PHC Pharmacist, PHC MO	Drug Stock Register, Equipment Checklist

10.Conclusion

Strengthening primary health care for silicosis is not just a medical necessity but a moral imperative especially in regions like Southern Rajasthan where entire communities depend on high-risk occupations for survival. By equipping PHCs with appropriate diagnostic tools, essential drugs, palliative care skills, and referral linkages, this framework ensures that care is brought closer to the most vulnerable populations. The integration of silicosis services with TB management, nutritional and welfare linkages, and community-based follow-up leverages existing health structures while addressing the unique socio-occupational realities of affected households. These measures will improve early detection, continuity of care and accountability within the health system, while also providing dignity and relief to those living with an incurable condition and saving them from unnecessary out of pocket expenditure on silicosis. In doing so, the framework strengthens the resilience of the primary health care system itself, transforming PHCs into responsive facilities for occupational health in high-burden areas.