

Review of Silicosis in Ajmer District



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Abstract

As mining and pulverizing of quartz and feldspar minerals is an important industrial activity of Ajmer district, so occupational health risk factors for silicosis are prevalent. The study was planned to review the status of silicosis disease and related social benefit schemes in Ajmer district. Seventy eight workers of quartz and feldspar pulverizing industry in and around Beawar were questioned about the exposure to silica, health hazards of industry, awareness for silicosis, available healthcare facilities and social benefit schemes. Average age of study population was 28.53 ± 7.33 and average duration of silica exposure was 5 ± 3.73 years. 66.67% have heard about 'silicosis' only 28.20% know about the clinical features. Forty one workers (52.56%) were aware about the health care facilities available for mining and pulverizing industry workers. We also analyzed online silicosis registration and grant disbursement portal and found out that there was statistically significant difference in pending cases for screening in different districts. Similarly for claim distribution there was huge discrepancy among different districts.

Keywords: Silicosis; Quartz; Feldspar; Mineral Pulverizing Industry; Social Benefit Scheme.

Introduction

Silicosis is the most common and the most historic occupational disease known to mankind. Hippocrates has described a condition of "breathlessness" in miners. The disease has been known as *Miners' Phthisis*, *Masons' disease*, *Grinders' asthma*, *Potters' rot* and *Stonecutters' disease*. Visconti used the term "silicosis" to describe the disease caused by inhalational exposure to silex. (Greenberg, M. I. 2007)

There are an estimated 11.5 million workers exposed to silica dust in India in both organized and unorganized sectors (Jindal 2013). Rajasthan is known for its stone works and stone industry for centuries. Workers engaged in silica mining, sand stone/granite drilling, quartz and feldspar pulverizing mills, stone-grinding, agate cutting and polishing, foundry work and construction industry are exposed to high concentration of silica dust and are prone for silicosis. Rajasthan state Government has taken the disease very seriously and several initiatives have been taken. The study was planned to review the silicosis in Ajmer district especially in the context of quartz and feldspar pulverizing industry.

Objectives of the Study

The study was undertaken as a part of thesis research project in Quartz and Feldspar pulverizing industry of Ajmer district. The objectives were

1. To study the awareness for silicosis in workers of quartz and feldspar pulverizing units of Beawar.
2. To know about the current status of online silicosis registration in Ajmer district.
3. To assess the implementation of social benefit schemes to silicosis patients in Ajmer district.

Hypothesis

We intended to test the following hypothesis

H₀₁: Workers of Quartz and Feldspar pulverizing mills of Beawar are aware of silicosis and social welfare scheme for silicosis patients.

H₀₂: Social welfare benefits for workers suffering from silicosis are being disbursed evenly.

Concept and Research Methodology:

The industrial areas in and around Beawar were visited to understand the various risk factors. The workers were enquired about the silicosis, preventive measures, health facilities being provided and available social benefits schemes. The silicosis patients' data of Rajasthan was retrieved from the online Government registry of silicosis patients. The data was then arranged in Microsoft Excel sheets and analyzed for

percentage distribution of cases in different districts. We compared the numbers of registration for silicosis screening in different districts, pending patients for screening and net certified cases in different districts. Silicosis grant disbursement and net certified cases pending for payment were also compared among different districts. As the online registry provide the information of live patients only, the Ajmer district silicosis committee records were reviewed for the death of patients from silicosis in Ajmer district.

Review of Literature

Silicosis is caused by inhalation of dust containing free silica or silicon dioxide (SiO₂). The disease was first reported in India from the Kolar Gold Mines (Mysore) in 1947. Ever since, its occurrence has been uncovered in various other industries, e.g., mining industry (coal, mica, gold, silver, lead, zinc, manganese and other metals), pottery and ceramic industry, sand blasting, metal grinding, building and construction work, rock mining, iron and steel industry and several others. The Incidence of silicosis depends upon the chemical composition of the dust, size of the particles, duration of exposure and individual susceptibility. Particles size of 0.5 to 3 micron known as 'respirable dust' is the most dangerous because it reaches the interior of the lungs with ease. The higher concentration of free silica in the dust and longer duration of exposure are the greatest risk factors for developing silicosis. (Park's 2015) There are no symptoms whatsoever whereby one can come to know about the onset of the disease in its early stages. Silicosis not only causes premature mortality, associated morbidities significantly affect the quality of life of sufferers. (NHRC 2014)

The diagnosis of silicosis is made by a team of expert including pulmonary physician and radiologist, on the basis of an occupational history of exposure, clinical symptoms and chest X-ray findings. The disease stage is determined from the size, shape and abundance of nodules in the lung parenchyma. The nodules increase in size and number as the exposure continues. Secondary parenchymal fibrosis causes shrinkage and pulling of hilar structures. (Greenberg 2007, Park 2015) Silicosis patients are prone to pulmonary tuberculosis, a condition called silico-tuberculosis. The radiological evidence in the two conditions is so similar that one is apt to mistake a case of silicosis to be a case of tuberculosis of lungs. There is no effective treatment for silicosis and no measures for prevention of the disease progression. Fibrotic changes that have already taken place cannot be reversed. Most importantly, the exposure should be promptly removed. Symptomatic treatment is provided for cough, sputum and breathlessness. (NHRC 2014, Park 2015)

Silicosis is a disabling, irreversible, fatal disease and continues to progress even when contact with silica stops. (NHRC 2014) so the need of hour is preventive measures. The only way that silicosis can be controlled is by rigorous dust control measures and regular physical examination of workers. (Park 2015) The NHRC of India has made important recommendations for adopting preventive measures such as occupational health and dust surveys; cost-

effective engineering control measures; protective gears for workers; dust control devices; education and awareness activities; occupational health and safety committee; and inter-sectoral coordination. These practices are practically nonexistent in the unorganized industry and are the need of hour.

Silicosis: a human rights issue

Silicosis is both a health issue and a human rights issue. It has an impact not only on the right to life but also on the right to live with dignity of all those affected and their families. (NHRC 2014) Rajasthan Human Rights Commission (RHRC) has seriously taken the matter of silicosis. Dr M K Devarajan, former member, Rajasthan State Human Rights Commission (RSHRC), is known for highlighting the plight of silicosis-affected patients since 2011, has drafted 59 special recommendations for prevention, detection, financial aid and rehabilitation of silicosis patients. The Rajasthan High Court Jaipur has taken cognizance of the issue through a PIL on silicosis started monitoring the implementation of the 59 recommendations contained in the special report of RSHRC. The state Government of Rajasthan is providing Rs 1 lakh as grant for a patient and Rs 3 lakhs for family after the death of a silicosis patient. Rajasthan has declared silicosis as a notified disease under the Rajasthan Epidemic Diseases Act, 1957, on January 22, 2015.

Silicosis Scenario in Rajasthan

Silicosis has emerged at an epidemic level in Rajasthan. A study in 1992-94 carried out by the Desert Medicine Research Center, Jodhpur reported that 9.9% sandstone workers had silicosis. A Jodhpur based NGO, Gramin Vikas Vigyan Samiti GRAVIS, and a Delhi based NGO, Participatory Research in Asia (PRIA) found that around 10% mines workers were suffering from the silicosis. A study conducted by the National Institute of Miners Health with the support of Association of Rural Advancement Through Voluntary Action and Local Involvement (ARAVALI), an agency of Government of Rajasthan, Dang Vikas Samiti (DVS), a Karauli based NGO with the poor mines workers of Karauli revealed that more than 74% of them were suffering from the silicosis. (Sishodiya, 2011)

Table: 1 Number of detection and death cases of silicosis in Rajasthan

Year	Number of Silicosis Cases Detected	Number of Affected Persons Who Have Died
2013-14	304	01
2014-15	905	60
2015-16	2186	153
2016-17	1536	235

Source: Office of State/ District T. B. Officer, Medical and Health Department, CAG report 2016-17

Pain and plight of Silicosis Patients of Rajasthan

1. The silicosis detection and certification process has been criticized from beginning. MK Devarajan of RSHRC has stated that says the detection mechanism is only just falling in place. "Actual numbers could well be in lakhs". The process of certification made the "workers being treated like footballs".

Remarking An Analisation

- There have been several protests by the silicosis patients in many districts of Rajasthan in last few years. Silicosis patients protested that the government should release compensation money in time, since they suffer a disease that cannot be cured. They further stressed that People were not getting the compensation even years after certification as administrative glitches often delay release of compensation money.
- The financial assistance of Rs 1 lakh on diagnosis and compensation of Rs 3 lakhs after death are of little help. Silicosis patients want the Government to release the full amount of Rs 4 lakhs while they are still alive. "Why wait until we die? The money should be given to while they are still alive, so they can use it to prolong their lives and increase the quality of lives of their families (The Times of India 2016 October 20).
- NGO Mine Labourers' Protection Campaign has raised the issue that why the patients have to visit the TB Hospital just to know if they have tested positive? Is that not a shame, in a country that bandies about terms like 'Digital India'?
- Silicosis patients want pension, not compensation after death. A PIL was accepted by Rajasthan High Court, Jodhpur in November 2018 that the compensation given to families of victims should be made available in form of pension while they are alive for meeting medical expenses. (The Times of India 2018 November 21)
- There is a welfare board for construction workers', the same is not there for the mining industry despite its large contribution to state's economy. Mine Labour Protection Campaign demand for constitution of the Mine Worker Welfare Board.
- The process of getting certified by the board has been time consuming multiple departments are involved in issuing of certificates, and the pendency is huge. Agents and broker have become active in few districts for easily providing certificates. There have been reports of providing forged silicosis certificates in 10,000 Rs. (Dainik Bhaskar 2018 March 01)

The Government has initially constituted Pneumoconiosis Board in SMS Medical College and six other government-run medical colleges in the state. Now there are Medical Boards at each district level while screening is available at Community Health Center level. The Government of Rajasthan has started online portal for Silicosis patients' registration for screening and disbursement of grant. (NIB_Silicosis 2018 May)

Rehabilitative Measures

Rajasthan was the first state in the country to form the Rajasthan Environment and Health Administrative Board (REHAB). The funds of REHAB cess are to be utilized for environmental and health service related schemes in the mining areas of the state only. Uptil financial year 2015-16 a total of 500.34 crore rupees have been collected under REHAB cess and only Rs 76.9753 crore (15.98%) were utilized. (Minutes of Eleventh REHAB Meeting) District Mineral Foundation Trust (DMFT)

The District Mineral Foundation Trust Rules, 2016 come into force on 12th day of January 2015. The offices of the trust are located in the Zila Parishad of respective districts. The objective of the trust is to work for the interest and benefit of the persons and areas affected by mining related operations in the district. The Pradhan Mantri Khanij Kshetra Kalyan Yojana (PMKKKY) and other welfare schemes of the State and Central Government shall be implemented by the District Mineral Foundations Trust of the respective districts. (The HINDU BussinessLine 2019 January 19) With just 24 % of the 23,606-crore of PMKKKY actually spent, the Centre has advised States to increase the spending under the DMFT programme, while ensuring that there is no fund diversion or leakage. According to Mining Secretary of Government of India there should be emphasis on the quality of expenditure. A proper monitoring mechanism has been put in place and there is a portal wherein data is being fed on a continuous basis and on-time monitoring is taking place. All States have been informed that appointment of auditors and audit activities should also be expedited and completed in a time-bound manner.

Table 2 depicts the status and utilization of DMFT in Rajasthan and Ajmer district. In the DMFT meeting for the second installment for financial year 2018-19, Rs. 48.32 crore were sanctioned for various development works in Ajmer district. Out of which Rs. 4.89 Crore has been sanctioned for procurement of equipments to extend health facilities for worker patients in JLN Medical College Hospital. Ninety three lakhs were approved for various department works in TB chest Department. For establishment of silicosis ward in Pulmonary Medicine Department Rs. 1.92 crores will be utilized. Similarly Rs. 6.45 Crores have been approved for TB Center of Beawar.

Table 2: District Mineral Foundation Trust of Rajasthan and Ajmer (as of December 2018)

Rajasthan	
Total mining lease in Rajasthan	15610
DMFT contribution in Rajasthan	2248.31 Crore Rs.
Project approved in Rajasthan	13917
Estimated cost of approved projects	2286.79 Crore Rs.
Ajmer	
Number of Lease in Ajmer	1067
DMFT contribution of Ajmer	169.30 Crore Rs.
Administrative sanction issued in Ajmer	823
Financial sanctioned issued	541
Sanctioned Amount for Ajmer	70.26 Crore Rs.
Number of completed project	0

Source: DMF Rajasthan, Department of Mines, Government of Rajasthan

A cross-sectional study was conducted by Yadav *et al.* (2011) in Desert Medicine Research Centre, Jodhpur to assess awareness and practices regarding silicosis among the sand stone quarry

workers in Jodhpur district of Rajasthan showed that about two- third (69.9%) of the sandstone quarry workers were aware of the causes of silicosis. About one- third (32.7%) of the sand stone quarry workers reported cough with breathlessness as the most important symptom of silicosis. However the worrying part is that all most all the sandstone quarry workers were not using any preventive measures. Yadav *et al.* suggested that continuous effort is needed to make them aware about causation, sign and symptoms, and preventive measures.

A study was conducted on 592 workers of Feldspat and quartz mills and mine in Cine, Turkey (Öztürk *et al.* 2012). The mean age of the workers was 31.8 ± 8.26 years. Duration of working was ≤ 5 years in 80.5% and ≥ 10 years in only 4.2%. They had measured the exposure to silica dust in different work areas of ball mill and reported that the threshold value was found to be exceeded in chopping, packaging and bagging parts of three workplaces.

Observations

We conducted a survey in the quartz and feldspar pulverizing mill areas of Beawar and surrounding areas in 2018. Table 3 summarizes the demographic and epidemiological profile of study population. Median age \pm SD of the study population was 28.53 ± 7.33 . There were 57 males and 21 females. 53.85% workers were smoker. The Kuppuswami social scale was used for socioeconomic status. Out of total 78 workers 56 were in upper lower

group and 22 were in lower middle group. The average silica exposure was 5 ± 3.73 years.

These workers were enquired about their knowledge for the health hazards of pulverizing industry. Positive response of knowledge was given by 69% to 78% workers, 14% to 19.2% were not able to decide and 6.75% to 23.07% were not aware of health issues on skin, hearing and respiratory system. Tuberculosis and Bronchial asthma diseases were heard by all of them, but the clinical features were known to 32% and 60.25% workers respectively. The disease silicosis name has been heard by 52 patients (66.67%) and only 22 (28.20%) knows about the clinical features.

Forty one workers (52.56%) were aware about the health care facilities available for mining and pulverizing industry workers, 30 (38.46%) were not able to say but 7 (8.97%) were completely unaware. Social benefit scheme for silicosis workers in which government provide one lakh for certified patients and three lakhs to deceased were known to 60.25% workers, however 17.94% workers were completely unaware of the scheme.

So the hypothesis H_{01} that the workers of quartz and feldspar pulverizing mills of Beawar are aware of silicosis and social benefit scheme for silicosis patients is rejected as a significant number of persons haven't heard about the disease and schemes.

Table 3: Demographic and Socioeconomic Conditions of Study Population at Beawar

S. no.	(n=78)	Number	Percentage
Age	< 20 years	5	6.41%
	21-30 years	54	69.2%
	31-40 years	11	14.10%
	> 40 years	8	10.25%
	Median age \pm SD	28.53 ± 7.33	
Sex	Male	57	73.07%
	Female	21	26.9%
Literacy	Below primary	8	10.25%
	Primary School	18	23.07%
	Middle school	19	24.36%
	Secondary school	17	21.8%
	Senior secondary	12	15.4%
Smoking	Graduate	4	5.20%
	Smoker	42	53.85%
Socio-economic status	Non-smoker	36	46.15%
	Upper Lower	56	71.8%
Cumulative years of Silica exposure	Lower middle	22	28.20%
	≤ 2 years	12	15.4%
	> 2- 5years	30	38.5%
	> 5- 10 years	26	33.3%
	> 10-15 years	8	10.25%
	> 15	2	2.6%
	Median \pm SD	5 ± 3.73	

The data of live silicosis patients were retrieved on 22th January 2019 from the silicosis portal of Government of Rajasthan. We observed that the silicosis patients have been registered from all the districts of Rajasthan, but 94% of cases were

registered from Jodhpur, Karauli, Bharatpur, Dhaulpur, Sirohi, Ajmer, Bhilwara, Rajsamand, Udaipur and Barmer districts of Rajasthan. (Table - 4)

Table 4: Summary of live Silicosis patients in different districts of Rajasthan –
Online registration status and disbursement of grant

District	Net Registered	Net Registered Cases Pending for Screening AT CHC	Net Registered Cases Pending for Screening MB	Net Certified cases	Net Rejected cases	Net Disbursed	Net Certified Cases Pending for Payment
Total in Rajasthan	26138	11858	1286	6806	6346	1424	5382
Jodhpur	6589	2500	96	1932	2062	728	1204
Karauli	3414	2535	384	42	453	0	42
Bharatpur	3160	632	107	1612	940	46	1566
Dhaulpur	2698	1543	238	481	455	145	336
Sirohi	2417	1552	35	624	206	4	620
Ajmer	2083	1368	87	149	479	0	149
Bhilwara	1974	932	183	269	590	48	221
Rajsamand	1039	234	102	39	664	0	39
Udaipur	677	37	2	638	0	418	220
Barmer	475	50	4	135	286	0	135
Nagaur	413	168	3	242	0	0	242
Pali	328	88	1	133	106	1	132
Jaipur	176	48	10	101	19	0	101
Dausa	131	32	0	99	0	0	99
Jhalawar	108	28	5	50	26	34	16
Kota	102	6	0	60	36	0	60
Other districts	354	105	29	200	24	0	200

CHC: Community Health Center;

MB: Medical Board Silicosis Patient Summary Report as on 22-01-2019.

Silicosis Grant Disbursement by Government of Rajasthan

After the start of online portal for Silicosis Grant Disbursement, A total of 26138 patients have registered for screening in Rajasthan upto 22nd January 2019. Out of those 13144 patients (50.28%) are pending for screening at Community Health Center or Medical Board levels. Maximum numbers of cases of silicosis (6589) have been registered in Jodhpur district, followed by Karauli (3414), and Bharatpur (3160). Figure 1 shows the distribution of registered cases for screening in different districts of Rajasthan.

On comparing the screening rate of different districts we noticed that there is a huge variation in pending for screening cases in different districts ranging from 5.88% to 85.50%. (Figure 2, figure 3. a) Similarly we also noticed that the rejection rate of different silicosis boards also vary from nil to 91.51%. We compared the data of Karauli and Bharatpur districts, the two adjacent districts which are having similar type of industries. The numbers of registered patients in Karauli and Bharatpur districts were 3414 and 3160 respectively, however there was huge differences in screening process in these districts, the pendency rate was 85.50% and 23.38% respectively, the difference was statistically significant ($p < 0.01$). Similarly out of screened patients 91.51% claims were rejected at Karauli while the rejection rate was only 36.83% in Bharatpur, the difference was statistically significant ($p < 0.01$).

In Ajmer district 2083 patients have been registered for screening, out of which 1455 (69.85%) patients are still waiting to be screened. Out of the 628 screened patients 479 (76.27%) have been rejected by the silicosis board. Total 149 patients have been certified for silicosis and all are waiting for grant. We visited district silicosis board and found out that 120 deaths due to silicosis have been registered and certified in Ajmer district up to 31st December 2018.

Udaipur district is having minimum pendency (5.76%) and none of the screened case was rejected, while Karauli is having very high pendency of 85.50%, and most of the screened cases were rejected (91.51%). The table-4 clearly shows the discrepancy in the efficiency and processing. Though the guideline has been formed but the functioning of different boards is not uniform and time bound. Similarly for claim distribution there has been huge discrepancy.

In Rajasthan, total 13152 patients have been screened out of which 6346 patients (48.25%) were rejected. A total 6806 patients were certified for *living with silicosis*, out of which 1424 (20.92%) claims have been disbursed. Majority of certified patients (79.08%) are still pending and waiting for financial aids. There is huge disparity in claim disbursements in different districts. Figure 3b clearly shows the uneven disbursement of silicosis grant thus the H₀₂ hypothesis is rejected.

Figure 1: Distribution of online registered cases for screening for Silicosis in different districts of Rajasthan as on 22nd January 2019

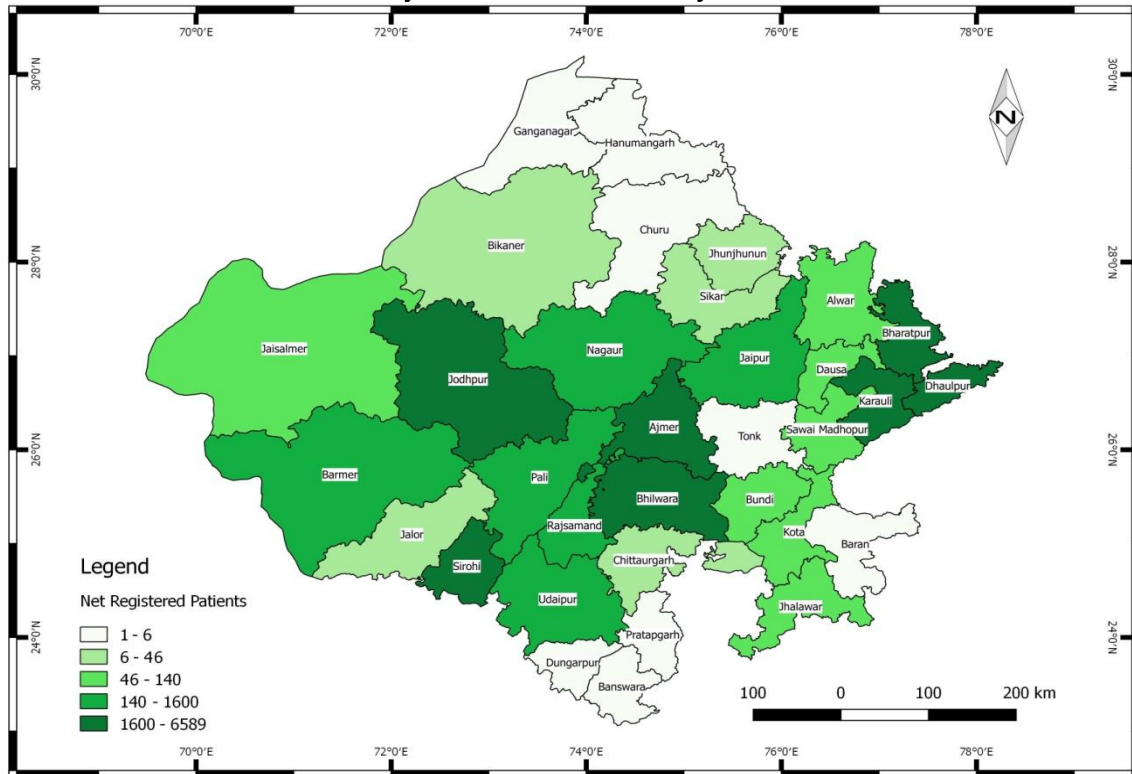


Figure 2: Distribution of Pending cases for silicosis screening in different districts of Rajasthan as on 22nd January 2019

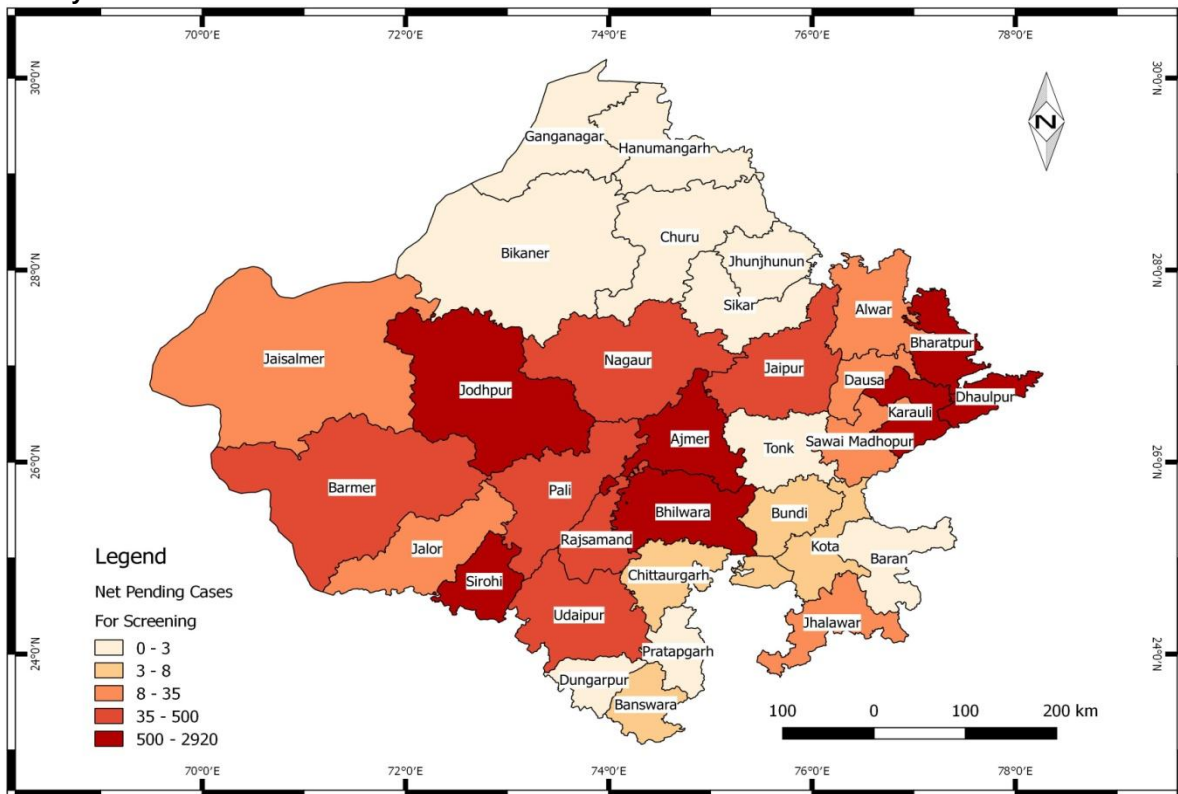
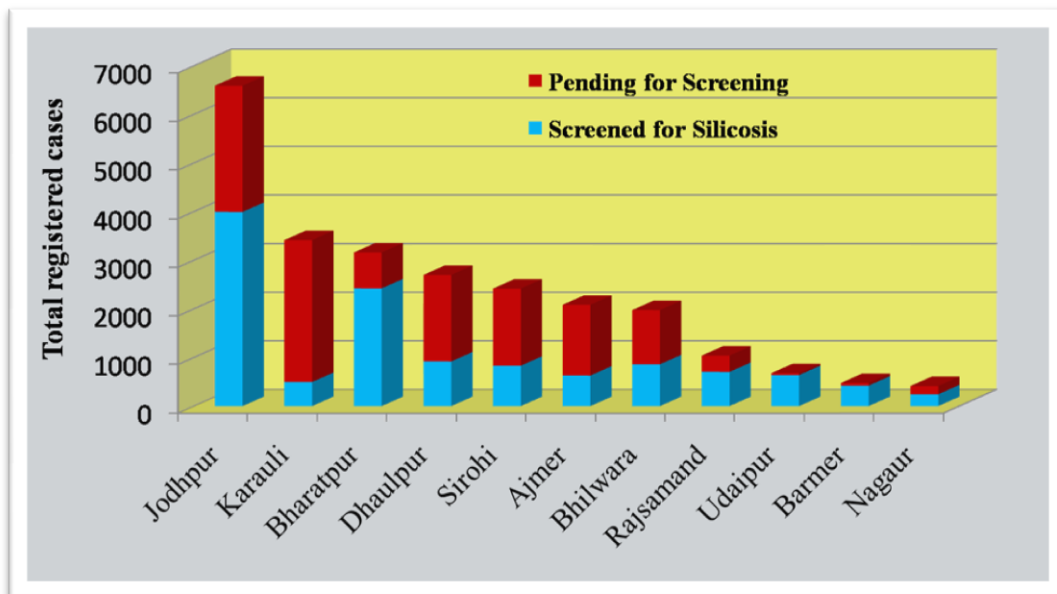
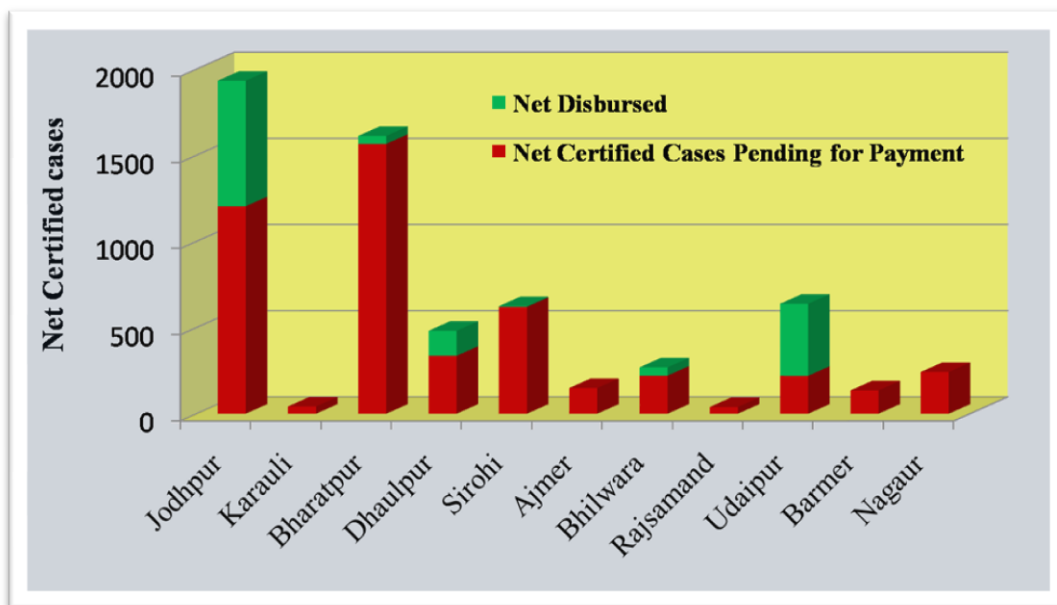


Figure 3: Silicosis summary from online Registration portal for Silicosis screening and Grant Disbursement in Rajasthan upto 22nd January 2019



a. Total registered cases and cases pending for screening



b. Net certified silicosis patients and disbursed grant

Conclusion

Silicosis continues to pose an important occupational health hazard in industrial workers of Rajasthan. Workers are not fully aware of the occupational health hazards and silicosis disease. Similarly awareness of available health care facilities and social benefit schemes are lacking. The Government of Rajasthan has adopted a sincere approach in last few years for silicosis detection and relief. The process of grant distribution has become more transparent, though we found major disparities in grant disbursement among different districts of Rajasthan.

Suggestions

1. Awareness about silicosis and its preventive measures should be increased in pulverizing industry of minerals.
2. It should be made mandatory for the industries to display about the various health hazards, their preventive measures, major symptoms, health facilities and social welfare schemes available to the workers.
3. Incentive should be given for installation of preventive techniques and equipments in pulverizing mills.

4. The infrastructure must be improved in industrial areas such as the conditions of roads and availability of water.
5. Green cover should be developed in mining and mineral pulverizing areas.

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Conflict of Interest

Authors declared no conflict of Interest.

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