OCCUPATIONAL RESPIRATORY DISEASES IN SOUTH AFRICA – RESULTS FROM SORDSA, 1997 - 1999

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Objectives. To describe the nature and extent of work-related respiratory diseases reported to the national Surveillance of Work-related and Occupational Respiratory Diseases in South Africa (SORDSA) reporting scheme. The causative agents and industrial categories in which they occurred are also characterised.

Design. Voluntary monthly reporting of newly diagnosed cases by pulmonologists, occupational medicine practitioners and occupational health nurses.

Setting. Medical and occupational health referral centres in the nine provinces of South Africa.

Subjects. Cases were workers from non-mining industries or ex-miners, suffering from a newly diagnosed occupational respiratory disease, reported to SORDSA between October 1996 and December 1999.

Outcome measures. Frequencies of reported occupational respiratory disease by year, reporting source, province and sex. Frequencies of short- and long-latency diseases by industry and causative agent.

Results. There was incomplete reporting coverage of the nine provinces in the first 3 years. Reporting was most comprehensive from Gauteng, KwaZulu-Natal and the Western Cape. Diseases with long latency periods made up 76.2% of the cases. Pneumoconiosis, even in non-mining industries, was the most frequently reported disease, followed by inhalation accidents. Occupational asthma was the fourth most reported disease. Apart from the prominence of pneumoconiosis, the results obtained by SORDSA are similar to those from a British occupational lung disease surveillance scheme. This study showed that newly diagnosed cases of occupational lung disease occurred in many industries and were caused by a variety of agents.

Conclusion. SORDSA has contributed insight into the nature, extent and distribution of occupational respiratory diseases in South Africa. It has also highlighted important causes of occupational respiratory diseases in South Africa, as well as hazardous industries. The data indicate that South Africa has a widespread occupational lung disease problem, and provide a platform for targeted prevention strategies.

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Information on the distribution and extent of newly diagnosed occupational lung diseases in South African workers has been collected since October 1996 by the Surveillance of Work-related and Occupational Respiratory Diseases (SORDSA) reporting scheme. The SORDSA programme also obtains information on the industry, occupation and causative agent for each notified case, with the aim of establishing occurrence and exposure patterns for the purposes of disease prevention. Cases are limited to workers in the non-mining sector and ex-miners, where no previous systematic data collection has taken place. The objective of this paper is to present the reporting results obtained in the initial 3 years of surveillance, namely 1997 - 1999.

METHODS

SORDSA's reporting structure includes a network of occupational medicine physicians, pulmonologists and occupational health nurses who voluntarily report cases of newly diagnosed occupational respiratory diseases on prescribed monthly forms. To support the reporting network, SORDSA has established regional representatives in each

province, whose role is to increase the reporting base in their region and assist general practitioners with case diagnosis and reporting. Details recorded on new cases included the nature of the disease, province and industry where the exposure occurred, occupation of the patient and causative agent. Regular contact with reporting units was maintained to optimise reporting and generate interest in the project.

Cases reported to SORDSA from October to December 1996 were combined with 1997 cases for the purposes of this article, since these initial 3 months served as a trial period for the registry and reporting was not fully established.

RESULTS

By the end of 1999, 393 occupational medicine practitioners, pulmonologists, and occupational health nurses from throughout South Africa were included in SORDSA's reporting structure. Reporting members were unevenly distributed among the nine provinces, as depicted in Table I. Gauteng had the highest number of reporting members. The Northern Province was the most poorly represented province (Table I). SORDSA reporting members were occupational medicine doctors belonging to the South African Society for Occupational Medicine (SASOM) (30.7%), pulmonologists belonging to the South African Thoracic Society (SATS) (16.1%), occupational health nurses belonging to the South African Society for Occupational Health Nurses (SASOHN) (27.5%), and doctors and nurses with no affiliation to the above societies (25.7%).

SORDSA received notification of 4 126 new cases of occupational respiratory disease during this period. Table II shows cases reported by year, province and reporting agent. The address of the reporting doctor or nurse was used to allocate patients to province. However, since a large number of patients had been exposed outside the province of the reporting doctor, the categorisation by province does not necessarily reflect the province in which the disease originated. The majority of cases were reported in 1998 (60.2%) and the least number of cases in 1999 (12.6%). The proportion of cases per province reflects the number of reporting members in that province. Most of the cases were reported by doctors. Occupational health nurses reported to SORDSA only from 1998, and reported 8.3% of the total number of cases.

Frequencies of diseases reported during the 3 years are shown in Table III. Pneumoconiosis, mainly in ex-miners, accounted for the most cases (54.9%). Inhalation accidents were reported in 8.5% of the cases. This was followed by a combination of tuberculosis and pneumoconiosis (6.9%), and occupational asthma (OA) with latency (6.0%). In 1997 and 1998, pneumoconiosis was the leading occupational lung disease reported, but in 1999 it was replaced by inhalation accidents. OA was the second most frequently reported disease in 1997, but the fourth most common in the two subsequent years. Diseases with long latency periods, mainly those diseases associated with mineral dust exposure

Table I. Doctors and nurses reporting to SORDSA by province 1997- 1999

Province	Doctors		Nurses		Total	
	N	%	*N*	%	*N*	%
Eastern Cape	15	6.5	12	7.4	27	6.9
Free State	8	3.5	11	6.8	19	4.8
Gauteng	92	40.0	43	26.4	135	34.4
KwaZulu-Natal	52	22.6	50	30.7	102	26.0
Mpumalanga	5	2.2	13	8.0	18	4.6
Northern Cape	6	2.6	4	2.5	10	2.5
Northern Province	3	1.3	3	1.8	6	1.5
North West	9	3.9	4	2.5	13	3.3
Western Cape	40	17.4	23	14.1	63	16.0
Total	230	100	163	100	393	100

Table II. Cases reported to SORDSA by province and year

Province	Cases reported by year			Total cases reported by		
	1997	1998	1999	Doctors	Nurses	Both
Eastern Cape	47	5	3	53	2	55
Free State	0	3	3	6	0	6
Gauteng	516	2 071	287	2 625	249	2 874
KwaZulu-Natal	166	159	153	442	36	478
Mpumalanga	19	36	9	19	45	64
Northern Cape	4	0	1	5	0	5
Northern Province	48	59	16	123	0	123
North West	6	12	0	8	10	18
Western Cape	319	139	46	503	0	503
Total	1 124	2 484	518	3 784	342	4 126

Table III. Frequency of diseases reported to SORDSA by year

Disease*	1997 (%)	1998 (%)	1999 (%)	Total % male	Total All (%)
Bronchitis	14 (1.2)	32 (1.3)	24 (4.6)	92.9	70 (1.7)
Byssinosis	12 (1.1)	2 (0.1)	5 (1.0)	84.2	19 (0.5)
Chronic obstructive pulmonary disease	27 (2.4)	14 (0.6)	45 (8.7)	93.0	86 (2.1)
Chronic obstructive pulmonary disease and pneumoconiosis	6 (0.5)	220 (8.9)	1 (0.2)	95.6	227 (5.5)
Inhalation accident	103 (9.2)	71 (2.9)	177 (34.2)	90.0	351 (8.5)
Irritant-induced asthma	31 (2.7)	30 (1.2)	14 (2.7)	86.7	75 (1.8)
Irritant reaction	23 (2.1)	1 (0.0)	0 (0.0)	87.5	24 (0.6)
Latex allergy	19 (1.7)	34 (1.4)	16 (3.1)	18.8	69 (1.7)
Lung cancer	13 (1.2)	12 (0.5)	3 (0.6)	96.4	28 (0.7)
Mesothelioma	39 (3.5)	16 (0.6)	2 (0.4)	93.0	57 (1.4)
Non-malignant pleural disease	39 (3.5)	70 (2.8)	21 (4.1)	75.4	130 (3.2)
Occupational asthma with latency	133 (11.8)	78 (3.1)	38 (7.3)	63.5	249 (6.0)
Other	12 (1.1)	10 (0.4)	1 (0.2)	91.3	23 (0.6)
Pneumoconiosis	533 (47.4)	1 610 (64.8)	122 (23.6)	60.2	2 265 (54.9)
Pneumoconiosis and tuberculosis	53 (4.7)	216 (8.7)	14 (2.7)	83.4	283 (6.9)
Rhinitis	4 (0.4)	25 (1.0)	6 (1.2)	80.0	35 (0.9)
Tuberculosis	63 (5.6)	43 (1.7)	29 (5.6)	84.4	135 (3.3)
Total	1 124	2 484	518	70.1	4 126

*Other diseases include pulmonary infiltrate eosinophilia, restrictive lung disease, scleroderma, cryptogenic fibrosing alveolitis, bagassosis, nasal septal perforation and granulomatous lung disease.

(pneumoconiosis, bronchitis, lung cancer, mesothelioma, chronic obstructive pulmonary disease and non-malignant pleural disease) constituted 76.2% of all cases reported. Diseases with a shorter latency period (OA, irritant-induced asthma, byssinosis, inhalation accidents, latex allergy, tuberculosis, rhinitis, allergic alveolitis and others) made up 23.8% of the reported cases. Male cases predominated, except for latex allergy, which was mainly reported in female nurses. A lower-than-expected proportion of the pneumoconiosis cases were male (60.2%).

Table IV shows the industries reported for cases of mineral dust-associated diseases, with the industries shown in order of reporting frequency. Mining was the most reported industry for all these diseases; however, a variety of non-mining industries were also implicated. Table V shows the industries reported for diseases with short-latency periods and industries reported overall. Short-latency diseases were most often reported from the paper and pulp industry (22.4%), which was also the second most frequently reported industry overall (5.4%). The health care sector was the second most frequently reported industry (15.5%), with OA and latex allergy forming the bulk of these cases. Overall, mining was the most frequently reported industry.

Table VI shows the causative agents reported for diseases of short and long latency. For diseases with short latency, chemical agents were most important (47.6%), followed by formulated agents (16.3%), organic agents (13.2%) and inorganic dust (11.0%). Of the short-latency diseases caused by inorganic dusts, tuberculosis was the most important. Inorganic dust was the predominant causative agent for long-latency diseases (94.8%). Formulated agents (0.2%), chemicals (0.6%), metal agents (0.6%), and organic agents (0.2%) were much less frequently reported for these diseases. Overall, the most reported categories of causative agents were inorganic dusts, chemicals and formulated agents.

The agents and industries responsible for inhalation accidents notified to SORDSA are listed in Tables VII and VIII. Sulphur dioxide and chlorine were the most frequently reported causative agents for this condition, and the vast majority of cases were reported from the paper and pulp industry, followed by the chemical industry.

Table IV. Pneumoconiosis and asbestos-related pleural diseases — industries reported to SORDSA 1997 - 1999

Disease	Industries
Silicosis	Mining, foundry, building and roadworks, quarrying, ceramic, sandblasting, iron and steel, engineering, metal, refining
Asbestosis	Mining, asbestos product industry, power, building and roadworks, iron and steel, motor industry, foundry, tile manufacture, railways, municipal service, metal industry
Coal worker's pneumoconiosis	Mining and power
Mesothelioma	Mining, asbestos products, building, railways, power, iron and steel, baking, municipal service, environmental, motor industry, education and research, refining, shipping
Non-malignant pleural disease	Mining, power, building, asbestos products, engineering, quarrying, environmental, chemical industry, metal industry, baking, municipal service, foundry, paint industry, railways, refrigeration, shipping, communication

Discussion

A strength of established surveillance schemes for occupational diseases in developed countries lies in good participation by reporting doctors. From 1989 to 1991, the Surveillance of Work-related and Occupational Respiratory Disease (SWORD) scheme in the UK had 83% of registered chest physicians in the UK and at least 1 physician in 90% of the country's chest clinics reporting to the scheme.[1] In comparison, SORDSA has less than 50% representation among the membership of each of the collaborating societies. Although efforts have been made to increase the reporting coverage, this has proved to be challenging in South Africa, where, especially in the poorer provinces such as the Northern Province with only 2 specialists per 100 000 population,[2] reporting of occupational disease cannot be given a high priority.

The number of cases reported to SORDSA decreased in 1999. This probably reflects a drop in the reporting rather than a decrease in incidence of occupational respiratory disease. Underreporting of cases to SORDSA is evident when the number of cases of compensable diseases submitted to SORDSA is compared with that submitted from the non-mining sector for compensation under the Compensation for Occupational Injuries and Diseases (COID) Act of 1993 (Act 130 of 1993)[3]. For example, in 1998, the non-mining sector reported 285 cases of pneumoconiosis for compensation (Office of the Compensation Commissioner, Department of Labour, compensation statistics for 1998/1999 — personal communication). The corresponding figure for SORDSA was 130. There were 180 cases of OA submitted for compensation in 1998 and 167 cases in 1999 (Office of the Compensation Commissioner — personal communication) yet only 78 OA cases were reported to SORDSA in 1998 and 38 in 1999. Underreporting is also obvious for mesothelioma. In 1998, the non-mining sector reported 65 cases of mesothelioma for compensation (Office of the Compensation Commissioner — personal communication), whereas only 16 cases were reported to SORDSA that year. A South African study registered 169 cases of mesothelioma per year on average between 1980 and 1984.[4] The South African National Cancer Registry had an average of 166 cases of mesothelioma per year reported between 1993 and 1995.[5] Therefore SORDSA's results underestimated real occupational lung disease occurrence. One way to obtain more comprehensive coverage would be the incorporation of compensation statistics into SORDSA's data. This is done in most occupational disease surveillance programmes in other countries.[6,7] However, in South Africa it is likely that a large number of cases remain undiagnosed, possibly because of lack of awareness of occupational diseases and their causes. SORDSA has been taking steps to improve awareness and educate workers and health care practitioners, but this requires greater effort and resources.

The SORDSA programme is the first of its kind in South Africa. Despite the limitations of the programme, a number of interesting findings can be reported. These provide useful insights into the nature and scope of occupational respiratory diseases in South Africa. The surveillance over the 3-year period, ending December 1999, has shown that even in the non-mining industries, pneumoconiosis and other dust-related diseases are still a major health problem in South Africa because of our poor disease prevention efforts. In total, over half the cases reported to SORDSA from 1997 to 1999 involved pneumoconiosis (54.9%), and the scheme did not cover diseases occurring in current miners who make up a large proportion of at-risk workers. Surveillance schemes have shown that pneumoconiosis rates are decreasing in developed countries. SWORD has published reports annually since 1989[1,8-14] and pneumoconiosis cases have shown a long-term decline from 418 cases (14% of the total cases) in 1989 to only 172 cases (6%) in 1995,[11] with a 10-year average of 11% of the reports.[15] Altogether, 76.2% of SORDSA's cases were diseases of long latency, associated with exposure to mineral dust, whereas for the SWORD project in the UK, just over half the reported cases were caused by exposure to mineral dust.[9]

Inhalation accidents made up 8.5% of SORDSA's cases and were the second most frequently reported condition overall during this period. Inhalation accidents reported to SWORD in the UK were prominent from 1993; in 1998 they constituted about 7% of all cases reported to SWORD and were the fifth most frequently reported condition overall and the second most common short-latency

Table V. Exposure industries for diseases with short latency and total cases reported to SORDSA 1997 - 1999

Industry	Short-latency diseases*		Total	
	N	%	*N*	%
Mining and quarrying	62	6.3	2 556	62.1
Paper and pulp	219	22.4	222	5.4
Asbestos	1	0.1	205	5.0
Iron and steel	22	2.3	163	4.0
Other	113	11.6	153	3.7
Health care	152	15.5	152	3.7
Building and roadworks	31	3.2	124	3.0
Chemical	94	9.6	97	2.4
Food, baking, grain milling, animal feeds	65	6.6	70	1.7
Refining	62	6.3	67	1.6
Foundry	17	1.7	63	1.5
Power	3	0.3	45	1.1
Motor	30	3.1	40	1.0
Vanadium and other metal production	11	1.1	29	0.7
Textile	28	2.9	28	0.7
Foam and plastic	21	2.2	22	0.5
Aluminium production	20	2.1	20	0.5
Engineering	8	0.8	17	0.4
Railways	5	0.5	15	0.4
Ceramic	2	0.2	15	0.4
Paint	12	1.2	14	0.3
Total	978	100	4 117†	100

*Diseases with long latency included pneumoconiosis, bronchitis, lung cancer, mesothelioma, chronic obstructive lung disease and non-malignant pleural disease. Diseases with short latency included occupational asthma, irritant-induced asthma, byssinosis, inhalation accidents, latex allergy, tuberculosis, rhinitis, allergic alveolitis and others. Other industries = wood, agriculture, municipal service, electronics, cosmetic, education, appliance, leather, match, mining technology, printing, refrigeration, resin, shipping, unknown, waste disposal, welding, game parks, fuel, communication, sandblasting, rubber, jewellery, pesticide, galvanising, shoe manufacturing, battery manufacture, crushing, canopy manufacture, atomic energy, warehousing, horse breeding, micro-electronics, pharmaceutical, brick making, fertiliser and tile manufacturing.
†Frequency missing = 9.

illness.[8,15] Sulphur dioxide and chlorine were responsible for the greatest proportion of SORDSA's inhalation accident cases, while the agents reported to SWORD were more varied. The industries responsible for the exposure also differed. In the SWORD scheme, health care (25.2%), motor vehicle manufacture (10.2%), chemical manufacture (7.8%) and rubber and plastic product manufacture (4.3%) were important industries for this condition during 1998,[8] in contrast with SORDSA's results where the majority of cases occurred in the paper and pulp industry (61.1%). These discrepancies probably reflect a lacuna in SORDSA's reporting coverage, since the vast majority of these cases were reported by one source only. Nevertheless, since inhalation accidents can be life-threatening and have sequelae such as asthma development,[16] this points to a specific problem that should be investigated.

SORDSA's data are overrepresented in certain sectors, such as health care and mining (ex-miners), because of active case-finding activities by certain SORDSA reporting members. Nevertheless, although this may distort the relative importance of certain diseases, industries and agents, it highlights some hazardous exposures that may have been previously unrecognised, such as latex-induced OA in health care workers. Industries associated with short-latency diseases reported to SORDSA were the paper and pulp industry, health care, chemical industry, and food industry. Apart from the paper and pulp industry, the industries were similar to those reported to SWORD, where the short-latency diseases most commonly reported were from health care (18.6%), food manufacture (9.7%) and chemical manufacture (8.4%).[8]

Conclusion

The data provided by SORDSA are valuable because they show that: (*i*) traditional dust diseases, which have been substantially eradicated in developed countries, are still currently diagnosed in many industries in South Africa; (*ii*) the frequency of reporting of some short-latency conditions indicates that excessive exposure is occurring in many workplaces; and (*iii*) South Africa has a widespread serious occupational lung disease problem, with new cases arising from many industries following exposure to a multitude of agents.

The first phase of the surveillance has provided useful new insights that could be used to inform a strategy for control of occupational lung diseases in South Africa.

Table VI. Causative agents for cases reported to SORDSA by disease latency 1997 - 1999

Agent	Short latency	Long latency	Total frequency
Chemical agents	467 (47.6%)	18 (0.6%)	485 (11.8%)
Sulphur dioxide	185	2	187
Chlorine	86	0	86
Isocyanates	58	2	60
Platinum salts	32	0	32
Other	23	3	26
Fumes	5	9	14
Organic solvents	10	0	10
Ammonia	9	0	9
Acids	7	2	9
Pesticides	9	0	9
Anhydrides	7	0	7
Combination	7	0	7
Pharmaceuticals	5	0	5
Acrylates	5	0	5
Hydrogen sulphide	5	0	5
Carbon monoxide	5	0	5
Formaldehyde	4	0	4
Amines	3	0	3
Xylene	2	0	2
Combination	13 (1.3%)	98 (3.1%)	111 (2.7%)
Dust and *Mycobacterium tuberculosis*	5	55	60
Dust, gas and fumes	1	25	26
Chemical and dust	7	12	19
Dust and welding fumes	0	6	6
Formulated	160 (16.3%)	6 (0.2%)	166 (4.0%)
Latex	121	0	121
Solder, colophony	14	4	18
Welding fumes	7	2	9
Glue and resin	8	0	8
Inks, paint, plastic	10	0	10
Inorganic dust	108 (11.0%)	2 979 (94.8%)	3 087 (74.8%)
Asbestos	4	2 320	2 324
Silica	75	235	310
Asbestos and silica	1	275	276
General dust	16	70	86
Brick dust	8	38	46
Asbestos and coal	0	13	13
Coal	1	8	9
Other mine dust	1	6	7
China, clay, kaolin, limestone	0	6	6
Silica and feldspar	0	5	5
Cement	2	3	5
Metal	51 (5.2%)	18 (0.6%)	69 (1.7%)
Vanadium	27	12	39
Aluminium	19	0	19
Other	3	2	5
Metal dust	1	2	3
Chrome	0	2	2
Lead oxide	1	0	1
Miscellaneous	10 (1.0%)	8 (0.3%)	18 (0.4%)
Other	5	7	12
Combustion products	5	1	6
Organic agents	130 (13.2%)	5 (0.2%)	135 (3.3%)
Flour, wheat, rye, maize	55	4	59
Microbial agents, fungi	37	0	37
Cotton	20	0	20
Animals	8	1	9
Plants	3	0	3
Other	3	0	3
Wood dust	2	0	2
Organic dust	2	0	2
Unknown	43 (4.4%)	12 (0.4%)	55 (1.3%)

Table VII. Causative agents for inhalation accident cases reported to SORDSA

Agent	Frequency	%
Sulphur dioxide	184	52.4
Chlorine	82	23.4
Unknown	17	4.8
Other chemicals	11	3.1
Pesticides	7	2.0
General dust	7	2.0
Hydrogen sulphide	5	1.4
Carbon monoxide	5	1.4
Combustion products	4	1.1
Ammonia	4	1.1
Anhydrides	4	1.1
Other	21	6.0
Total	351	100

Table VIII . Exposure industries for inhalation accident cases reported to SORDSA

Industry	Frequency	%
Paper and pulp	214	61.0
Chemical industry	84	23.9
Other	17	4.8
Platinum refining	13	3.7
Metal, iron and steel	7	2.0
Pesticide industry	6	1.7
Shipping industry	5	1.4
Foam and plastic industry	5	1.4
Total	351	100.0

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