Original Article

Knowledge and Awareness Assessment Regarding Silicosis among Saudi Population

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Abstract

Silicosis is a disease that results from Inhaling crystalline silica dust, it is one of the oldest occupational illnesses. The most common complications of silicosis are fibrosis and lung cancer. which is caused by the exposure time of silica dust in the workplace and job demands continued exposure to crystalline silica dust was the leading cause of morbidity and possibly death in workers worldwide. The aim of this study is the assessment of Knowledge and attitudes inhalation of dust that contains free crystalline silica among Saudi populations. This study was conducted in Saudi Arabia as a descriptive cross-sectional with a minimum sample size of 384. The data was collected employing a questionnaire translated into simple Arabic language. The data are going to be analyzed by using a statistical package for social since (IBM, SPSS version 25). The study included 389 participants, 64.8% of them were females and 35.2% were males. 58.6% were 20- 30 years old. 19% of participants have heard of silicosis before. 2.1% of participants have or know someone who has silicosis. 26.2% know what silica dust is. 73.3% know that work or training in a dusty environment may expose risks of respiratory diseases. 39.8% of participants have enough knowledge scores of silicosis, 20.6% have moderate knowledge, 19.5% have weak knowledge, and 20.1% have very low knowledge. Our study shows that the Saudi population has moderate knowledge and awareness of silicosis. Awareness was significantly associated with older age and Saudi nationality.

Keywords: Knowledge, Awareness, Silicosis, Complications, Prevention

Introduction

Silicosis is a disease that results from Inhaling crystalline silica dust, it is one of the oldest occupational illnesses known to humans. The most common complications of silicosis are fibrosis and lung cancer. which is caused by the exposure time of silica dust in the workplace and job demands that continue exposure to crystalline silica dust is leading cause to morbidity and possibly death in workers worldwide [1-3]. According to World Health Organization (WHO) research from 2002, pneumoconiosis carried on by airborne particles results in 30,000 global deaths and 12,88,000 Disability Adjusted Life years (DALYs) per year. The prevalence of silicosis varies widely in India, from 3.5 percent in the ordnance factory to 54.6 percent in the slate-pencil sector; this variance is caused by various silica concentrations in the workplace, exposure time, and job demands [4]. From 1996 to 2017, 216 silicosis cases in the UK were documented. Workers who labor in industries are most likely to get silicosis [5]. There are numerous professions where employees may be exposed to crystalline silica, including mining, quarrying, building, the glass sector, polyester, agriculture, and industries that produce metal products. Two-thirds of all work-related deaths worldwide are caused in Asia, with Africa and Europe following closely behind at 11.8 and 11.7 percent, respectively [6]. A recent study was published in 2021 aimed to assess silicosis knowledge and awareness among workers and the findings revealed that while the disease's source and prevention are well known, its harmful health impacts continue to affect the world's workforce. The negative health impacts of silicosis can be prevented in both natural and synthetic stone workers with more education and awareness [7]. Over the previous few decades, exposure to crystalline silica dust was a leading cause of mortality among workers worldwide. even lower levels of exposure are related to the rise in the prevalence of tuberculosis among minerals [8]. Workers continue to experience chronic overexposure to silica despite an overall decreasing prevalence of silicosis with advanced disease and

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morbidity, according to research published in 2018 in Michigan [9]. Due to insignificant numbers related to our topic, especially in Saudi Arabia. there is still a lack of information regarding knowledge and awareness about silicosis in Saudi Arabia. The study aimed to assess Knowledge and awareness regarding Silicosis among Saudi populations.

Materials and Methods

Study Design, and Setting

This study was a cross-sectional questionnaire survey among all Saudi population in KSA. The based questionnaire was developed by the authors. This study was conducted in Saudi Arabia during 2022-2023, the data was collected from all regions of Saudi Arabia.

Inclusion and Exclusion Criteria

This study included the Saudi population exposed to silica, older than 18 years old, female and male. We exclude populations more than 80 or younger than 18 years old and workers with various disorders such as memory or hearing impairment.

Sample Size

The sample size was estimated using the Qualtrics calculator with a confidence level of 95%; and a sample size of 384.

The sample size was calculated by using the formula: n= P (1-P) * Z^2 / E^2
with a 5% margin of error, and a confidence interval (CI) of 95%. The minimum sample size estimated for the study: is n = 0.50 (1- 0.50) * (1.96) ^2 / (0.05) ^2 = 384.
n: the required sample size
P: the estimated prevalence of knowledge
Q: (1-0.50) =50%, i.e, 0.50
Z: the value corresponding to the level of confidence required (1-a) = 1.96.
E: the percentage of maximum acceptable error = 0.05.

Method for Data Collection and Instrument (Data Collection Technique and Tools)

The questionnaire was created by the authors of this study and we use it as a tool, the questionnaire consists of the first 2 parts, demographic data on age, sex, education, nationality, smoking, and employment of the people of Saudi Arabia. The second part related to the knowledge and awareness of silicosis among the Saudi population. We have reviewed the scoring system because the correct answer gets 3 points while the wrong answer gets 1 point. the answer "Not sure" is 2 points and "I don't know " gets zero points. The total possible score is 48. so we assume a score of zero to twelve points (<25%) is very low Knowledge, while a score of 13-24 points (that is, 25%- 50%) is considered poor knowledge, a score of 25-36 is considered moderate knowledge, and a score of 37 points or more (that is, more than 75%) is considered sufficient or good knowledge.

Analyzes and Entry Method

The data was verified by hand, then coded and entered into a personal computer. Data was analyzed by the Statistical Package for Social Sciences (IBM, SPSS version 25). Descriptive statistics (i.e., frequency, percentage, mean, and standard deviation) were calculated. Tests of significance (i.e., chi-square) were applied to test the significance of differences in knowledge, attitude, and practice according to the personal characteristics of participants. P-values less than 0.05 were considered statistically significant.

Results and Discussion

The study included 389 participants, 64.8% of them were females and 35.2% were males. 58.6% were 20- 30 years old and 14.4% were 31- 40 years old. 90.7% of the studied sample were Saudi. 79.2% of participants were university educated while 18.5% were secondary school education. 12.9% were smokers. 1.5% of participants were civil engineers working in a dusty area and 0.5% were agriculture engineers.

Table 1. Sociodemographic characteristics of participants (n=389)

Parameter		No.	%
Gender	Male	137	35.2
	Female	252	64.8
Age	less than 20	20	5.1
	20 - 30	228	58.6
	31 - 40	56	14.4
	41 - 50	47	12.1
	51 - 60	38	9.8
Nationality	Saudi	353	90.7
	Non-Saudi	36	9.3
Education level	primary	2	.5
	middle	7	1.8
	secondary	72	18.5
	university	308	79.2
Smoking	Yes	50	12.9
	no	339	87.1
Work in a dusty environment	Civil engineer	6	1.5
	Agricultural engineer	2	.5
	No	381	97.9

(Figure 1) shows that only 19% of participants have heard of silicosis before.

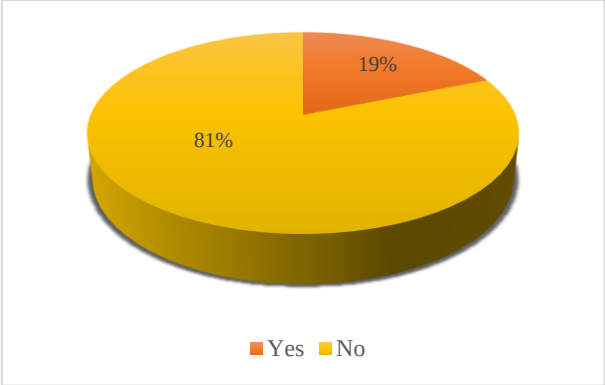

Figure 1. Participants who heard of silicosis (n= 389)

As illustrated in **(Table 2)**, 2.1% of participants have or know someone who has silicosis. 26.2% know what silica dust is. 73.3% know that work or training in a dusty environment may expose them to risks of respiratory diseases.

Table 2. Participants knowledge and prevalence of silicosis (n=389)

	Yes	No
Have or know someone who has silicosis	8 2.1%	381 97.9%
Know what silica dust is	102 26.2%	287 73.8%
Know that work or training in a dusty environment may expose you to risks of respiratory diseases	285 73.3%	104 26.7%

(Table 3) shows participants' awareness of symptoms, risk factors, complications, and prevention of silicosis. 31.4% of participants reported that persistent cough is a symptom of silicosis, 41.4% reported shortness of breath, 35.5% reported tiredness and weakness, 21.3% reported night sweats and fever, 11.1% swollen legs, and 18.8% reported lips color change to blue. 44.7% of participants reported that silicosis is a serious condition for a smoker. 37.8% reported that silicosis depends on the worker's health condition. 58.4% reported that reducing exposure to dust in the work environment is a preventive measure to silicosis, 62.5% reported wearing a mask or protective clothing while working is a preventive measure to silicosis, and 51.2% reported using respirators that protect against inhalation of silica dust. Regarding complications, 15.9% reported tuberculosis, 32.6% lung Cancer, and 40.1% reported chronic bronchitis.

Table 3. Participants' awareness of symptoms, risk factors, complications, and prevention of silicosis

	Yes	No	Don't know	Not sure
A persistent cough is a symptom of silicosis	122 31.4%	21 5.4%	190 48.8%	56 14.4%
Shortness of breath is a symptom of silicosis	161 41.4%	16 4.1%	142 36.5%	70 18.0%
Tiredness and weakness are a symptom of silicosis	138 35.5%	23 5.9%	158 40.6%	70 18.0%
Night sweats and fever is a symptom of silicosis	83 21.3%	36 9.3%	185 47.6%	85 21.9%
Swollen legs are a symptom of silicosis	43 11.1%	54 13.9%	197 50.6%	95 24.4%
Lips changing color to blue is a symptom of silicosis	73 18.8%	38 9.8%	188 48.3%	90 23.1%
Silicosis is a serious condition for a smoker	174 44.7%	15 3.9%	138 35.5%	62 15.9%
Silicosis depends on the worker's health condition	147 37.8%	31 8.0%	146 37.5%	65 16.7%
Does your company perform regular medical examinations?	48 12.3%	132 33.9%	172 44.2%	37 9.5%
Always use personal protective equipment when working in a dusty environment	109 28.0%	102 26.2%	135 34.7%	43 11.1%
Reducing exposure to dust in the work environment is a preventive measure of silicosis.	227 58.4%	19 4.9%	96 24.7%	47 12.1%
Wearing a mask or protective clothing while working is a preventive measure of silicosis.	242 62.2%	29 7.5%	92 23.7%	26 6.7%
Using respirators that protect against inhalation of silica dust is a preventive measure of silicosis.	199 51.2%	45 11.6%	101 26.0%	44 11.3%
Tuberculosis	62 15.9%	37 9.5%	194 49.9%	96 24.7%
Lung Cancer	127 32.6%	24 6.2%	166 42.7%	72 18.5%
Chronic bronchitis	156 40.1%	18 4.6%	156 40.1%	59 15.2%

(Figure 2) shows that 39.8% of participants have enough knowledge scores of silicosis, 20.6% have moderate knowledge, 19.5% have weak knowledge, and 20.1% have very low knowledge.

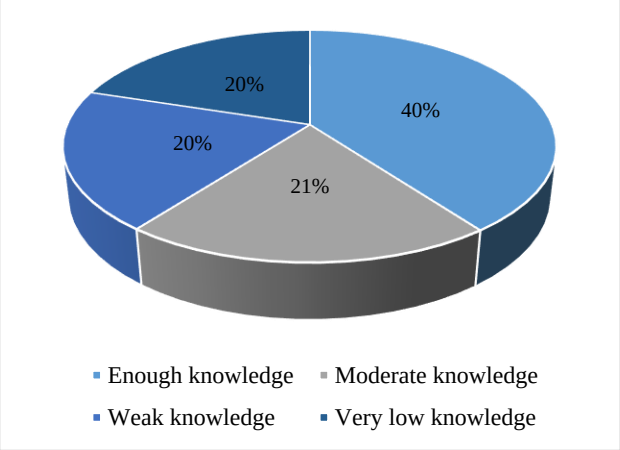

Figure 2. Knowledge score of participants of silicosis (n= 389)

(Table 4) shows that there was a significant association between knowledge scores of silicosis among participants with older age and Saudi nationality (P< 0.05).

Table 4. Participants' knowledge scores of silicosis in association with their sociodemographic characters (n=389)

		Knowledge score				Total (N=389)	P value
		Enough knowledge	Moderate knowledge	Weak knowledge	Very low knowledge		
Gender	**Male**	52 13.4%	28 7.2%	24 6.2%	33 8.5%	137 35.2%	0.503

	Female	103	52	52	45	252	
		26.5%	13.4%	13.4%	11.6%	64.8%	
	less than 20	11	4	2	3	20	
		2.8%	1.0%	0.5%	0.8%	5.1%	
	20 - 30	107	50	37	34	228	
		27.5%	12.9%	9.5%	8.7%	58.6%	
Age	**31 - 40**	12	12	18	14	56	0.001
		3.1%	3.1%	4.6%	3.6%	14.4%	
	41 - 50	11	10	13	13	47	
		2.8%	2.6%	3.3%	3.3%	12.1%	
	51 - 60	14	4	6	14	38	
		3.6%	1.0%	1.5%	3.6%	9.8%	
	Saudi	134	77	68	74	353	
		34.4%	19.8%	17.5%	19.0%	90.7%	
Nationality	**Non-Saudi**	21	3	8	4	36	0.046
		5.4%	0.8%	2.1%	1.0%	9.3%	
	primary	1	0	1	0	2	
		0.3%	0.0%	0.3%	0.0%	0.5%	
	middle	3	0	1	3	7	
		0.8%	0.0%	0.3%	0.8%	1.8%	
Education level	**secondary**	33	13	15	11	72	0.592
		8.5%	3.3%	3.9%	2.8%	18.5%	
	collegiate	118	67	59	64	308	
		30.3%	17.2%	15.2%	16.5%	79.2%	
	Yes	21	9	7	13	50	
		5.4%	2.3%	1.8%	3.3%	12.9%	
Smoking	**No**	134	71	69	65	339	0.539
		34.4%	18.3%	17.7%	16.7%	87.1%	

The occupational lung illness known as silicosis is brought on by silica inhalation. Chronic uncomplicated silicosis is the most prevalent kind. Early on, the majority of people with chronic uncomplicated silicosis don't exhibit any symptoms. As a result, if a chest x-ray is not performed, many individuals and medical professionals are unable to identify the condition.

Tens of millions of individuals who work in dangerous occupations are still affected by silicosis, which kills thousands of people a year around the world despite all prevention measures. One of the most significant occupational health conditions in the world, silicosis has the potential to result in progressive and lifelong physical impairment. This study aimed to assess Knowledge and awareness regarding Silicosis among Saudi populations.

According to our study results, 39.8% of participants have enough knowledge scores of silicosis, 20.6% have moderate knowledge, 19.5% have weak knowledge, and 20.1% have very low knowledge. This was comparable to a previous study that reported similar knowledge scores [10]. According to another survey, most workers possessed the right information and attitudes about silicosis. Only 26% of them, however, were properly informed that it was an incurable illness [11]. According to another survey, only 80.9% of participants had ever heard of the term "silicosis," with the remainder knowing anything about the disease [12]. In a different study, just 40% of participants from two different locations knew the name of the disease [13]. According to the results of a different study, most of the sample (52%) had above-average awareness of silicosis and its prophylaxis, whereas 48% had below-average awareness [14].

Regarding symptoms, 31.4% of participants reported that persistent cough is a symptom of silicosis, 41.4% reported shortness of breath, 35.5% reported tiredness and weakness, 21.3% reported night sweats and fever, 11.1% swollen legs, and 18.8% reported lips color change to blue. This was comparable to a previous study reported that (32.7%) of the sandstone quarry workers attributed cough with breathing difficulties as the most important symptom of silicosis but some of the respondents also mentioned fever for more than 15 days (20.5%), fever with loss of weight (20.7%) or

weakness, loss of appetite and fever in the evening (12.2%) as main symptoms of silicosis [10]. Another study reported that more than 80% of subjects were not aware of the symptoms and causes of silicosis [12]. This is almost similar to the observations by Nandi *et al*. [13].

Prevention is the only treatment for silicosis. Our results show that 58.4% reported reducing exposure to dust in the work environment is a preventive measure to silicosis, 62.5% reported wearing a mask or protective clothing while working is a preventive measure to silicosis, and 51.2% reported using respirators that protect against inhalation of silica dust. According to a prior study, several of the workers covered their mouths and noses with cloths to avoid inhaling silica when dust clouds were formed during dry drilling. No employee was utilizing wet drilling. Comparably, none of the workers were wearing masks to guard against silica inhalation. Few (3.4%) people consumed 100 g of jaggery daily to draw out the silica particles they inhaled while working and as a prophylactic precaution [10].

Our study revealed a positive correlation between older age and Saudi nationality with knowledge score of silicosis but not with educational level or other sociodemographic characteristics. This was contrary to reported previously in a survey as there was a positive correlation between education and awareness about silicosis (65.8% of illiterate to 95.7% respondents of middle school educated) [10], which was on the line with another study found that better knowledge, attitude, and practices were associated with higher education levels, longer duration of work, and non-smoking [11]. These outcomes are in line with Bhagwan's (2013) research. According to that study, workers with higher educational attainment were more likely to use preventive measures and were more aware of the negative effects of occupational exposure to silica dust [15]. Donald C. Cole's research from 2019 also showed that employees with higher education levels were more likely to report utilizing preventative measures [16]. Another survey reported a positive correlation has been observed between education level and awareness about silicosis in different studies [12, 13] which was in line with another study that reported that awareness regarding silicosis, its symptoms, and causes was relatively better among younger age group compared to elder one probably because of difference in education level of these subjects [14].

To effectively advocate for demands and maintain the participation and involvement of the target groups, health education about silicosis and awareness of personal protection and preventive measures against it should be carried out in a way that is need-based, appropriate for the area concerned, and acceptable to the target groups. A particularly important issue is the lack of implementation of preventive measures against silica inhalation. The control scheme also mandates the completion of vocational training. The diagnosing and treating physicians must receive the appropriate training in lung illnesses.

Conclusion

Our study shows that the Saudi population has moderate knowledge and awareness of silicosis. Awareness was significantly associated with older age and Saudi nationality. A surplus impact can be caused by illiteracy and a lack of understanding of how to utilize protective measures in high-risk groups. To raise knowledge of the cause and effects of silicosis among high-risk employees, it is advised that free seminars, symposiums, and medical camps be held at various levels in medical facilities.

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ETHICS STATEMENT: Ethical approval was obtained from the Research Ethical Committee at the Ministry of Health, Jeddah, Saudi Arabia (Ethical approval number: A01699). Participants were informed that their participation is voluntary and filling the questionnaire indicates their consent to participate.
Written consent was obtained from all individual participants included in the study.

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