

Evaluation of Knowledge Level About Asbestos Exposure in Urban Transformation Construction Areas

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ABSTRACT

Since Turkey is in an earthquake zone, historically there has been a lot of demolition in various cities, including Istanbul which contains many historical places. Residents of Istanbul are subject to calamity regulations and plans that fall under these regulations. Older buildings, and those in a state of disrepair which are not in compliance with regulations, are demolished to make the city safer. In this context, urban transformations are based in Istanbul.

In many cases Istanbul's demolitions reveal carcinogenic asbestos fibers, which are known to have carcinogenic effects. Building employees are directly exposed to asbestos dust, and the local community is indirectly exposed. Protecting against the negative health affects of asbestos on building employees who are working in buildings unknown to have asbestos is under discussion.

The aim of this study is to create awareness of asbestos and to protect against its negative affects on building employees working in urban transformations areas. Surveys show that the employees are uninformed about asbestos and its effects. The projects must continue to create awareness.

Keywords: Asbestos, exposure to asbestos, urban transformation, occupational illness.

INTRODUCTION

Along with the development of industry, the notion of occupational illness has also developed. Many employees are exposed to occupational illnesses because of their workplaces and working conditions. Asbestos is a dust that causes occupational illnesses and deaths. Asbestos was used widely in industry because it was a durable, fire-retardant insulator at a time when few alternatives were available. The World Health Organization (WHO) estimates that globally about

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125 million people are exposed to asbestos in their workplace and each year more than 107.000 deaths are attributable to occupational exposure to asbestos.¹

Asbestos exposure in industry was first realised in 1898 by factory supervisors in England, a world industrial leader. The harms of asbestos were discussed and safety precautions and limitations to asbestos usage were introduced at this time. Since occupational diseases in asbestos exposed workers increased, it was determined that restrictions on asbestos usage were insufficient, according to studies.^{2,3} Asbestos was proven to be a human carcinogen in 1977 by the International Agency for Research on Cancer (IARC), in 1980 by the World Health Organization (WHO) and National Toxicology Program (NTP) and in 1986 by the United States Environmental Protection Agency (U.S. EPA).⁴

It is known that the use of asbestos in Europe was limited, and since the 1980's, asbestos has been prohibited.⁵ With a shared directive in 1999 (1999/77/EC), European Union countries discussed the restriction of the use and marketing of asbestos, and on 1 January 2015, a complete ban on asbestos has been implemented in European Union countries.

With a 2003 directive related to the protection of workers against the risks of asbestos exposure (2003/18/EC), the prohibition of any activity that exposes workers to asbestos fiber at the stage of asbestos removal and production was discussed in the council. As a result, this prohibition was applied in European Union countries from 2006 and special precautions were taken to protect the community from asbestos at the stage of repairing and/or demolishing buildings containing asbestos.²

One of the sectors where asbestos is prominent is the construction sector. In our country, according to Law 6306 on Renovating Buildings That Carry Disaster Risk, urban transformation has begun on older buildings. Workers involved in this process and residents of demolition areas could easily have been exposed to asbestos. Although formal limitations are being followed, there is a consensus among scientists that exposure to asbestos is not yet at safe levels.

The aim of this study is to determine the level of awareness among urban transformation site workers about carcinogenic asbestos dust, and to raise their awareness about the health effects of asbestos.

METHODOLOGY

This study was carried out with randomly selected volunteers aged 19 to 63 working in urban transformation sites in the Kartal, Maltepe and Kadıköy districts of Istanbul's Anatolian Side. Data were collected between April 2017 and June 2017 by face-to-face interview with surveys. Ethical approval of this study was

obtained from Istanbul Medipol University Social Sciences Scientific Researchs Ethical Committee on 13.04.2017 (Approval no 43037191-604.01.01.-E.9596).

In surveys, we asked questions to workers who are likely to be exposed to asbestos in order determine the following information:

- Rate of smoking
- Rate of staff who sought x-ray examinations
- Rates of hand and machine washing if work clothes are cleaned at home, and the rate of who washed the clothes
- Rate of asbestos-related disease in family
- Rate of awareness level of asbestos by age and occupation (engineers and others...)
- How many people think that protection precautions are taken at the demolition stage?
- Which personal protectors are used most?
- Rate of working on urban transformation projects
- Are health scans done?
- To which dust are workers most exposed?
- How are health problems shared with workplace physician?

In this study, we used the 'Simple Random Sample Size Estimation' method.

$$n = \frac{Nt^2pq}{d^2(N-1)+t^2pq}$$

N: Number of individuals in the environment

n: Number of individuals to be sampled

p: Occurrence frequency of the reviewed event

q: Non-occurrence frequency of the reviewed event

t: Theoretical value in the T table at a certain degree of independence and at a determined level of error

d: ± deviation to be made according to the frequency of occurrence of the event

$$n = \frac{(100)(1.96)^2(0.90)(0.10)}{(0.05)^2(1000-1)+(1.96)^2(0.90)(0.10)}$$

n=122 minimum total event quantity

We planned total event quantity as 125-130 when considering the losses and completed the study with 125 significant data.

The NCSS 2007 Statistical Software (Number Cruncher Statistical System) (NCSS LLC, Kaysville, Utah, USA) and IBM SPSS 23.0 programmes were used to evaluate the data. The reliability analysis of the questions which were developed for

determination of asbestos knowledge, was done with Kuder-Richardson-20 test. Along with descriptive statistical methods (Average, standard deviation, median, frequency, ratio, minimum and maximum), the Mann Whitney U test was used to compare quantitative data that don't show normal distribution between groups. For evaluation of relation between variants, non-parametric Spearman's Correlation Analysis was used and meaningfulness was evaluated on $p < 0.05$ level.

RESULTS

This study was carried out with total of 125 construction workers of which 28.0% were white collar workers (n=35) and 72.0% were (n=90) blue collar workers. The age of the participants varied between 19-63 and the average age is 34.54 ± 10.48 . In a study that was conducted by Köksal et al., 488 subjects participated in that study and the mean age of female subjects were 49.8 ± 12.7 while male subjects were 52.1 ± 13.2 .⁶ Şahin et al. also conducted a study that consisted of 132 villagers in Karağı village, Isparta. Mean age of participants was 53.21 ± 13.57 years and age range was 30-79.⁷

Table 1. Distribution of descriptive properties.

	n	%
Exposed construction site dust^a		
Asbestos	32	25.6
Iron dust	44	35.2
Wood dust	39	31.2
Lime dust	43	34.4
Other dusts	52	41.6
Occupation		
Blue collar	90	72.0
White collar	35	28.0
Time period of work		
< 1 month	8	6.4
1-3 months	27	21.6
3-6 months	18	14.4
6-12 months	20	16.0
> 12 months	52	41.6
Previous job (n=87)		
Blue collar	65	74.7
White collar	22	25.3
Smoking		
Yes	53	42.4
No	62	49.6
Quit smoking	10	8.0
Age (years)		
Minimum-Maximum (Median)	19-63 (32)	
Average \pm SD	34.54 ± 10.48	

^aSeen more than once

In Table 1, 25.6% of the workers (n=32) were exposed to asbestos dust while 35.2% (n=44) were exposed to iron dust, 31.2% (n=39) to wood dust, 34.4% (n=43) to lime dust and 41.6% (n=52) to other dusts.

When evaluating the time periods of work; 6.4% of the workers (n=8) worked less than one month, 21.6% (n=27) worked between 1-3 months, 14.4% (n=18) between 3-6 months, 16.0% (n=20) between 6-12 months and 41.6 (n=52) worked more than 12 months. 74.7% of the workers (n=65) were a blue collar position in their previous employment while 25.3% of the others (n=22) had white collar jobs.

42.4% of the participants (n=53) were smokers, 49.6% of them (n=62) were non-smokers, and 8.0% of (n=10) the workers had quit smoking. In a study that was conducted by Şahin et al., 55 (41.7%) of 132 participants were smokers and 77 (58.3%) of others were non-smokers.⁷ According to another study, 41.2% (n=54) of villagers in Eskisehir who were exposed to asbestos were smokers and 58.8% (n=77) of others were non-smokers.⁸

In Table 2, there are no genetic diseases in 83.2% of participants (n=104) and/or their families while 16.8% of others (n=21) and/or their families have genetic diseases. Diabetes is found in 66.7% of those with genetic diseases (n=14), cancer in 9.5% (n=2), heart disease in 28.6% (n=6) and other diseases in 14.3% (n=3).

90.4% of participants (n=113) don't use medicines regularly while 9.6% (n=12) do. 37.6% of the workers (n=47) did not have an x-ray in the past year but 62.4% of the other workers (n=78) did. 43.6% of the workers had an x-ray in the past month, 16.7% within 3-6 months, 20.5% within 6-12 months and 19.2% had an x-ray 12 months ago and more.

22.4% of workers (n=28) don't wash their clothes at home while 77.6% (n=97) do. 16.5% of the workers (n=16) that wash their clothes at home, wash their clothes by hand, 83.5% (n=81) use a washing machine, 41.2% (n=40) wash the clothes by themselves, 36.1% (n=35) have them washed by their wives/husbands, 21.6% (n=21) by friends/relatives and 1.0% (n=1) by other relatives.

96.0% of the workers' families (n=120) have no family members with asbestos related diseases while 4.0% of other workers (n=5) do. 40.0% of family members with asbestos related diseases (n=2) have lung cancer, 20.0% (n=1) have stomach/bowel cancer, 20.0% (n=1) have other tumors and 20.0% (n=1) have shortness of breath.

Table 2. Dispersions of diseases.

	n	%
Presence of genetic diseases in the worker and/or in his/her family		
Yes	104	83.2
No	21	16.8
Type of genetic diseases^a (n=21)		
Diabetes mellitus	14	66.7
Cancer	2	9.5
Heart diseases	6	28.6
Chromosomal disorders	0	0.0
Others	3	14.3
Regular use of medications		
No	113	90.4
Yes	12	9.6
X-Ray extraction in the previous year		
No	47	37.6
Yes	78	62.4
Time of X-Ray extraction in the previous year (n=78)		
Within the last 3 months	34	43.6
3-6 months	13	16.7
6-12 months	16	20.5
> 12 months	15	19.2
Washing clothes at home		
No	28	22.4
Yes	97	77.6
Washing style of clothes		
By hand	16	16.5
In washing machine	81	83.5
Who washes the clothes? (n=97)		
Worker	40	41.2
Wife/Husband	35	36.1
Friend, relatives	21	21.6
Other	1	1.0
Family member with asbestos related diseases		
Does not exist	120	96.0
Exists	5	4.0
Asbestos related diseases in family (n=5)		
Lung cancer	2	40.0
Stomach/bowel cancer	1	20.0
Other tumors	1	20.0
Shortness of breath	1	20.0

^aSeen more than once

Table 3. Dispersion of answers given to questions about asbestos.

	Yes		No	
	n	%	n	%
Asbestos is a dust that cause lung cancers, and is considered as an occupational hazard.	85	68.0	40	32.0
Duration of responsibility about asbestos is 10 years	9	7.2	116	92.8
Wearing gloves and protective masks are sufficient to prevent harm from asbestos related works.	11	8.8	114	91.2
Materials that contain asbestos can be disposed of alongside domestic waste.	2	1.6	123	98.4
Asbestos is a fire-resistant material and has low permeability to electricity.	6	4.8	119	95.2
Asbestos shows it's effects after many years.	22	17.6	103	82.4
Smoking doesn't trigger the negative effects of asbestos.	2	1.6	123	98.4
There isn't any legislation about asbestos in our country.	5	4.0	120	96.0
The site chief can carry out works after educating the asbestos workers.	9	7.2	116	92.8
Asbestos is resistant to acids and bases.	8	6.4	117	93.6
The most used asbestos type is chrysotile.	15	12.0	110	88.0
Equipment used in asbestos works such as overalls, gloves etc. is disposable.	19	15.2	106	84.8
Asbestos waste is directly disposed of in water-resistant polyethylene (PE), polypropylene (PP) and 'Big-Bag' bags.	21	16.8	104	83.2

When we look at the Table 3, 68.0% of workers (n=85) answered yes when asked whether 'Asbestos is a dust that causes lung cancer and considered as an occupational hazard.' while 32.0% (n=40) answered 'No'.

7.2% of workers (n=9) answered yes when asked whether 'Duration of responsibility about asbestos is 10 years' while 92.8% (n=116) answered 'No'.

8.8% of workers (n=11) answered yes when asked whether 'Wearing gloves and protection masks are sufficient to prevent harm from asbestos related works.' while 91.2% (n=114) answered 'No'.

1.6% of workers (n=2) answered yes when asked whether 'Materials that contain asbestos can be disposed of alongside domestic waste.' while 98.4% (n=123) answered 'No'.

4.8% of workers (n=6) answered yes when asked whether 'Asbestos is a fire-

resistant material and has low permeability to electricity.’ while 95.2% (n=119) answered ‘No’.

17.6% of workers (n=22) answered yes when asked whether ‘Asbestos shows it’s effects after many years.’ while 82.4% (n=103) answered ‘No’.

1.6% of workers (n=2) answered yes when asked whether ‘Smoking doesn’t trigger negative effects of asbestos.’ while 98.4% (n=123) answered ‘No’.

4.0% of workers (n=5) answered yes when asked whether ‘There isn’t any legislation about asbestos in our country.’ while 96.0% (n=120) answered ‘No’.

7.2% of workers (n=9) answered yes when asked whether ‘Site chief can carry out works by educating the asbestos workers.’ while 92.8% (n=116) answered ‘No’.

6.4% of workers (n=8) answered yes when asked whether ‘Asbestos is resistant to acids and bases.’ while 93.6% (n=117) answered ‘No’.

Table 4. Dispersion of knowledge of asbestos removing and regulations.

	n	%
Information about the 28539 numbered regulation of Health and Social Security Protections in Asbestos Works which was published in official newspaper on 25 January 2013		
No	100	80.0
Yes	25	20.0
Have any education sessions about asbestos removal been organized?		
No	93	74.4
Yes	32	25.6
Frequency of sessions (n=32)		
Once a year	1	3.1
Twice a year	1	3.1
At the beginning of every asbestos removal	10	31.3
Unknown	20	62.5
Who is/are leading the education sessions?^a		
Site chief	3	9.4
Staff	-	-
Asbestos removal worker	7	21.9
Job Security Specialist	21	65.6
Asbestos removal specialist	3	9.4
Project manager	-	-
Other	1	3.1

^aChecked more than one option.

12.0% of workers (n=15) answered yes when asked whether 'The most used asbestos type is chrysotile.' while 88.0% (n=110) answered 'No'.

15.2% of workers (n=19) answered yes when asked whether 'Equipments used in asbestos works such as overalls, gloves etc. are disposable.' while 84.8% (n=106) answered 'No'.

16.8% of workers (n=21) answered yes when asked whether 'Asbestos waste is directly disposed of in water-resistant polyethylene (PE), polypropylene (PP) and 'Big-Bag' bags.' while 83.2% (n=104) answered 'No'.

In Table 4, 80.0% of participants (n=100) have no information about the 28539 numbered regulation of Health and Social Security Protections in Asbestos Works which was published on 25 January 2013, while 20.0% of others (n=25) have knowledge about it.

74.4% of workers (n=93) said that they don't receive any education about asbestos removal, but 25.6% of other workers (n=32) are getting education about asbestos removal. 3.1% (n=1) said that the education sessions are organized once a year, 3.1% (n=1) said twice a year, 31.3% (n=10) said that there is a session at the beginning of every asbestos removal, 62.5% (n=20) don't know the frequency. When a question about who leads the education sessions was asked, 9.4% of participants answered 'the site chief', 21.9% answered 'an asbestos removal worker', 65.6% answered 'the job security specialist', 9.4% answered 'an asbestos removal specialist' and 3.1% of answered 'other people'.

In Table 5, There were no precautions taken at the pre and post-demolition stages in 15.2% of demolitions (n=19), in 84.8% of other demolitions (n=106), precautions were taken. When analyzing the security precautions, it can be seen that 46.2% (n=49) are risk assessments, 23.6% (n=25) are measurements of environment, 64.2% (n=68) are health scans, 25.5% (n=27) are isolated areas, 63.2% (n=67) are personal protections, 12.3% (n=13) are asbestos removal education sessions, 11.3% (n=12) are spraying water on asbestos-containing material, 51.9% (n=55) are alert/warning signs and 1.9% of them (n=2) are other security precautions.

84.8% of personal protection equipment (n=106) are helmets, 49.6% (n=62) protective clothes, 69.6% (n=87) gloves, 79.2% (n=99) work shoes, 58.4% (n=73) breathing masks and 14.4% (n=18) are other precautions.

68.8% of workers (n=86) were involved in 1-3 urban transformation projects, while 21.6% of them (n=27) were involved in 3-10, and 9.6% (n=12) were involved in more than 10 projects.

Table 5. Dispersion of precautions at pre and post-demolition stages of buildings.

	n	%
Precautions before and after demolition of buildings		
Not taken	19	15.2
Taken	106	84.8
Precautions that were taken at demolition (n=106)^a		
Risk assessments	49	46.2
Measurement of environment	25	23.6
Health scans	68	64.2
Isolating the area	27	25.5
Personal protection	67	63.2
Asbestos removal education session	13	12.3
Spraying water on asbestos-containing materials	12	11.3
Alert/Warning Signs	55	51.9
Other precautions	2	1.9
Personal protections^a		
Helmets	106	84.8
Protective clothes	62	49.6
Gloves	87	69.6
Work shoes	99	79.2
Breathing masks	73	58.4
Others	18	14.4
Number of Urban Transformation projects in which workers were involved		
Between 1-3	86	68.8
Between 3-10	27	21.6
>10	12	9.6
Removal of Asbestos-containing material before demolition		
No	90	72.0
Yes	35	28.0
Complete Precaution at the demolition stage		
No	33	26.4
Yes	92	73.6
Complete Precautions that were taken (n=92)^a		
Heating the building/material	59	64.1
Putting netting around the building	54	58.7
Sending workers away from building	64	69.6
Other precautions	6	6.5

^aChecked more than one option.

72.0% of participants (n=90) state that asbestos-containing materials weren't removed before demolition, while 28.0% of them (n=35) stated the opposite.

26.4% of the workers (n=33) expressed that complete precautions weren't taken at the demolition phase, 73.6% of other workers (n=92) said that complete precautions were taken. When evaluating complete precautions, 64.1% (n=59) are

heating the building/material, 58.7% (n=54) are putting a netting around the building, 69.6% (n=64) are sending workers away from building and 6.5% (n=6) are the other precautions.

Table 6. Dispersion of health scans and sharing of health concerns.

	n	%
Frequency of Health Scans		
When entering a job	41	32.8
When entering a job and periodical	82	65.6
Never	2	1.6
Sharing health concerns with workplace physician		
Everytime	87	69.6
Sometimes	28	22.4
No workplace physician	7	5.6
I don't share	3	2.4

When evaluating the frequency of health scans on workers in Table 6, 32.8% of workers (n=41) were scanned when they started their job, 65.6% (n=82) were scanned when they started their job and periodically and 1.6% (n=2) were not scanned.

69.6% of participants (n=87) always share their health concerns with their workplace physician, 22.4% (n=28) share sometimes, 2.4% (n=3) never share and 5.6% (n=7) state that there is no workplace physician at their workplace.

Score of Asbestos Knowledge

A total score was obtained from 8 informational questions about asbestos; 'Asbestos is a dust that causes lung cancers and considered as an occupational hazard.', 'Duration of responsibility about asbestos is 10 years', 'Asbestos is a fire-resistant material and has low permeability to electricity.', 'Asbestos shows its effects after many years.', 'Asbestos is resistant to acids and bases.', 'The most used asbestos type is chrysotile.', 'Equipment used in asbestos works such as overalls, gloves etc. is disposable.', 'Asbestos waste is directly disposed of in water-resistant polyethylene (PE), polypropylene (PP) and 'Big-Bag' bags.' and the question regarding 'Information about the 28539 numbered regulation of Health and Social Security Protections in Asbestos Works which was published in official newspaper on 25 January 2013'.

The score of asbestos knowledge is calculated from 9 questions, 1 point for each correctly answered question and 0 points for a wrong answer. The obtained score is converted to 100 point scale. According to this scale, participants who answered all questions correctly will receive 100 points, and participants who answered all questions incorrectly 0 points (Table 7).

Table 7. Dispersion of asbestos knowledge scores.

Score of asbestos knowledge	<i>Minimum-Maximum (median) Average±Standard Deviation</i>	0-88.9 (11.11) 18.67±20.86
Number of correctly answered questions; n (%)	0	27 (21.6%)
	1	61 (48.8%)
	2	11 (8.8%)
	3	7 (5.6%)
	4	5 (4.0%)
	5	5 (4.0%)
	6	3 (2.4%)
	7	5 (4.0%)
8	1 (0.8%)	

The scores of the participants in this study range from 0 to 88.9 and average score is 18.67±20.86.

Table 8. Evaluation of asbestos knowledge score according to occupation.

		Occupation		<i>P</i>
		Blue Collar Workers (n=90)	White Collar Workers (n=35)	
Asbestos knowledge score	<i>Minimum-Maximum (Median) Average±Standard Deviation</i>	0-77.8 (11.11) 13.83±15.65	0-88.9 (22.22) 31.11±26.92	0.001**

*Mann Whitney U Test **p<0.01*

Blue collar workers' asbestos knowledge score is 13.83±15.65 points, and the white collar workers' is 31.11±26.92 points. There is a statistically significant difference between blue and white collar workers ($p=0.001$; $p<0.01$). The asbestos knowledge score of white collar workers is significantly higher than the blue collar workers' score (Table 8).

Table 9. Age and level of asbestos knowledge score relationship.

	r	p
Level of Asbestos Knowledge Score - Age Relationship	0.142	0.114

r: Spearman's Correlation Coefficient

There is no significant relationship between age and level of asbestos knowledge ($p>0.05$) (Table 9).

Result of the reliability analysis on survey questions is 0.79 (Kuder Richardson-20).

DISCUSSION AND CONCLUSION

Asbestos is the general term used for the fibrous silicates such as actinolite, grunerite (amosite), anthophyllite, chrysotile, crocidolite, tremolite. It was generally used in buildings for insulation purposes.⁹ There has been steep rise in the production and use of asbestos in the last 100 years. Asbestos consumption has levelled off in recent years to about 4 million tones (1983).¹⁰ However, all forms of asbestos are known human carcinogens and classified as group 1 human carcinogen by International Agency for Research on Cancer (IARC).¹¹ It has been shown that asbestos can induce transformation of cells in culture, including mesothelial cells and fibroblasts.¹² Therefore, asbestos is a reason for mesothelioma alongside with lung, larynx, and ovary cancer.¹¹

This study carried out with urban transformation workers aims to raise awareness about asbestos exposure to workers and to create sensitivity to asbestos.

As a result of the survey evaluations, 70.4% of the workers have no information about asbestos. 21.6% of the workers didn't give the correct answer to all 9 questions in the survey study and only 1 question in 9 was answered correctly by 48.8% of the workers. Workers who gave at least 1 correct answer to questions, were able to give the right answer thanks to the preliminary information given before the survey study. A lot of workers learned in the preliminary information that asbestos is carcinogen and that they can be exposed to it in urban transformation projects. Thus, our study raised awareness regarding the toxic effects of asbestos.

It is observed that the number of asbestos removal workers is too low and generally, the same workers do the asbestos removal jobs. Even these workers have not shown the expected success in the asbestos knowledge survey. As a result, it is observed that even asbestos removal workers who are educated regularly about this subject need more education about asbestos.

When evaluating the results of the survey, it is thought that the least aspirated dust is asbestos with a ratio of 25.6%, after iron dust with 35.2%, wood dust with 31.2%, lime dust with 34.4% and other dusts with 41.6%. It is thought that reason for low ratio of asbestos dust aspiration is the failure to measure it, and that fact that many workers don't know what asbestos is.

Another evaluation is the number of smokers. The percentage of non-smokers is approximately 49.6%. 83.2% of workers don't think that they and their family have genetic diseases. 90.4% of workers regularly use medicines. Despite their work conditions, construction workers think that they are healthy.

62.4% of workers appear to have had an x-ray in the last year because they had

lung x-rays before asbestos and heavy works.

We thought that family members may also have been exposed to asbestos due to contact with construction clothes, so we asked a question about how the clothes are washed. 22.4% of workers don't wash their clothes at home while 77.6% do. Of workers who wash their clothes at home, 16.5% of them wash their clothes by hand, 83.5% wash them in a machine. 41.2% of workers wash their clothes by themselves, 36.1% have them washed by their wives/husbands, 21.6% by friends/relatives and 1.0% by other relatives.

In a question for evaluating the asbestos consciousness, 74.4% of workers said that education on asbestos removal was not organized. When asked a question about who gives the education, workers said that 9.4% of educators are site chiefs, 21.9% asbestos removal staff, 65.6% job security specialist, 9.4% asbestos removal specialist and 3.1% other educators. 80.0% of workers never heard about asbestos regulations.

It is understood that precautions were taken mostly for personal protection. 63.2% of precautions are personal protections and 64.2% are health scans. Risk assessment regulations suggest on-site protection precautions firstly and make personal protections the lowest priority. 84.8% of personal protective equipments are helmets, 79.2% are work shoes and gloves, masks, protective clothes come after them. Because the most used personal protective equipment was a helmet, it is understood that these personal protections weren't selected for protection from asbestos dust.

We grouped personnel like engineers, architects, job security specialist as white collar workers and other personnel as blue collar workers and made an awareness test. 28% of personnel are white collar workers and 72% are blue collar workers. It is observed that white collar workers seem like they have heard about what asbestos is, but they received only 26.92 points in a 88.9-point survey. This result shows that site chief or job security specialist are not qualified enough to give information and education to workers even if they know about asbestos. There is no meaningful relationship between age and asbestos awareness level.

Setting up a contamination unit and ventilation system for asbestos is very expensive. Therefore, audits conducted by official institutions are extremely important.

Studies about asbestos reveal that asbestos related occupational diseases should be reported and records should be kept. Employers and workers should be informed about legal regulations and rights in the case of an occupational disease. Some arrangements should be made for asbestos removal workers such as work-

ers compensation fees and early retirement packages, by analyzing the studies and legislations in other countries such as Croatia and Slovenia.

It is unknown whether there is asbestos in many Istanbul buildings because there is no inventory information about buildings. All urban transformation workers should have information about asbestos. It should be added to current education regulations that all workers must be educated about asbestos whether there is asbestos in urban transformation site or not. This education can be given to workers by asbestos removal specialists before starting at job. Education about the health effects of asbestos by workplace physician should be provided.

It is obvious that employers also need to be aware of asbestos and measurements about asbestos should be done in all urban transformation sites. Workers should not enter construction sites without taking the necessary precautions and risk assessment reports.

We think that importance should be given to asbestos because it shows its effect after many years. Our current regulations about asbestos guide us about what needs to be done, but it was observed that there isn't any application and awareness about asbestos. It is obvious that carrying out more scientific research, creating public advertisements by government and organizing education sessions about asbestos are needed to increase awareness.

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