



## SURVEY OF DERMATITIS CASES DUE TO CEMENT IN SUFFIAN CEMENT FACTORY

SUFFIAN ÇİMENTO FABRİKASINDA ÇİMENTO'YA BAĞLI DERMATİT OLGULARINI İNCELEYEN BİR GÖZLEM ÇALIŞMASI

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**Key Words :** Dermatitis , Cement , Occupational diseases.

### SUMMARY

Background and objectives: Cement as an important factor for extension and development of the industries, towns and housing is of utmost importance. Nowadays, there are 12 major cement factories with 10000 workers in our country. Dermatitis is the most significant disease prevalent in such factories and the aim of this study is to determine the rate of dermatitis cases due to cement and to diagnose their causes and existing predisposing factors that are useful in treatment of the patients and prevention of the disease .

Material and method : In this study, 542 workers of TABRIZ suffian cement factory were studied average ages were from 21 to 60 years old. Survey variables include work period the way of contact with cement, primary location of lesion appearance, predisposing factors the relation between the creation of dermatitis and worker's working environment in the factory and the relation between the work period and the disease creation and prevalence percentage of dermatitis. To complete this survey we prepared some questionnaires which were answered by the factory workers.

Results: According to the obtained results, 153 workers out of 542 were affected with dermatitis (28.2 %). The most affected area in these patients were their palms. Furthermore, there is a meaningful relation between the worker's working location and the rate of dermatitis appearance. To prove this fact we can take the workers of loading center into considera, 62.5 % of them had been affected with dermatitis and there was also a direct relation between their work period and disease prevalence in the factory.

Conclusion: High prevalence rate of dermatitis due to cement is because of disobeying the work hygiene and safety rules in the factory and the existence of several allergens in cement. To decrease the rate of danger , accurate sanitation rules are necessary and can be helpful .

### ÖZET

*Amaç: Endüstrilerin gelişimi ve genişlemesi için önemli bir faktör olan çimento, şehirler ve konutlar kurulması için de son derece önemlidir. Günümüzde, İran'da 10000 işçisi ile 12 büyük çimento fabrikası vardır. Dermatit bazı fabrikalarda hüküm süren en önemli hastalıktır. Bu çalışmanın amaçları çimento ile ilişkili dermatit'in oranını, nedenlerini, ve oluşumuna yol açan faktörleri belirlemek ve hastalığın önlenmesi ve hastaların tedavisinde yararlı olabilecek faktörleri saptamaktır.*

*Gereç Yöntem: Yaşları 21-60 arasında değişen 542 Tabriz suffian çimento fabrika işçisi çalışmaya dahil edildi .*

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Örneklemede aşağıdaki değişkenlere ait parametreler incelendi: çalışma dönemi, çimento ile temas yolu, lezyonların esas lokalizasyonları, dermatit oluşumu ile işçilerin çalışma ortamları arasındaki ilişki, çalışma süresi ile hastalık oluşumu arasındaki ilişki, dermatit prevalansı. İşçiler tarafından doldurulmak üzere bir anket formu hazırlandı.

**Bulgular :** Dermatit 542 işçinin 153'ünde (%28.2) vardı. En çok etkilenen bölgeler avuç içleri idi. Dermatit görülmesi ile işçilerin çalışma yerleri arasında anlamlı bir ilişki vardı. Yükleme bölgesinde çalışan işçiler ele alındığında dermatit işçilerin %62.5 'unda vardı. Dermatit sıklığı ile fabrikada çalışma süreci arasında anlamlı direkt bir ilişki saptandı.

**Sonuç.** Yüksek dermatit oranının çalışma hijyenine uyulmaması, fabrika güvenlik kurallarına uyulmaması ve çimento da bulunan allerjenler sonucu olduğu düşünülmüştür. Sanitasyon önlemlerinin alınmasının gerekli olduğu sonucuna varılmıştır.

## INTRODUCTION

Occupational dermatitis is one of the most significant existing dermatitis in the field of dermatology. According to the latest medical occupation statistics in the USA, 34% of the total dermatitis is occupational dermatitis and 20% of the patients do not go to their job 11 days a year and the absence of workers at work, their treatment and medical charges impose a considerable loss to the factories (1). Dermatit due to cement is one of the most prevalent contact dermatitis in our country.

This dermatitis can appear in two forms: irritant and allergic. In the irritant form, irritation takes place because of high basic property of cement and in allergic, the type 2 sensitivity takes place. Because of the famous allergens of chromium and cobalt, dermatitis appears (2). In general contact dermatitis occurs as a result of direct contact with the stimulants. In these patients, affected areas can usually be seen in open parts of the body. Hands, forearms and particularly back of the hands and the edges of the fingers are affected which have the most contact (1). For irritant dermatitis to reappear, the same number of contacts with stimulants are required. But, in allergic contact dermatitis just a little contact with allergen is sufficient. Totally, more than 2000 allergen chemical substances have been identified. These substances are not complete antigens but they must penetrate into skin and connect to the proteins and form a bipolar connection. These substances are called Hapten prior to mixing with proteins.

From the allergic dermatitis travel point of view a person's contact time duration with the allergen material without dermatitis appearance, is called the resistance period. Most people remain in this stage almost forever. The next stage is the stage of establishment in which the real sensitivity takes place in approximately 14-21 days. Practically, the patient's sensitivity must be regarded as a whole life duration specially if the patient is sensitive to a substance which is impossible for him to cut contact with it (1).

In treating dermatitis due to cement when the burning has been caused by cement, soon after the body contacts with cement, the cement particles must be removed immediately from the skin by a wet cloth then the body must be washed with water and soap then a closed

dressings containing antibiotic ointment must be applied. If there is a black scar or gangrene on the skin, a suitable treatment is removing the dead tissue or debridement (3).

In order to reduce the dermatitis resulting from chromium that exists in cement, scorbic acid solution 0.5-1% can be used. Placing the hands into this solution regularly may be helpful and another way is to convert the six valence chromate into three valence chromate. By this way the sensitivity rate of chromium in cement will decrease (4). Using protective creams can also be useful for preventing the dermatitis outbreak among the workers of the factory (5,6,7)



Figure - 1. contact dermatitis.

## MATERIALS METHODS

In this study 542 workers of TABRIZ Suffian cement factory were studied whose average ages were from 21 to 60 years old. Survey variables include work period, the way of contact with cement primary location of lesion appearance, previous similar lesions, predisposing factors for dermatitis creation, the location of lesion appearance and its form and symptoms. The other variables include relation between the appearance of dermatitis and workers working area and also the relation between work period and creation of the disease and dermatitis break out percentage resulting from cement. To complete this study, we prepared some questionnaires which were completed by the factory workers. Suffian cement factory is located 33 kilometers far from TABRIZ. Its height from the sea is 1349 meters and its average temperature is 12.50°C.

Cement is defined as a hardening hydraulic which is divided into two kinds :

- 1- Natural cement which is obtained by grinding the cement stone
- 2- Artificial cement or portland cement which was registered in 1824 in London and is obtained by cooking clay or calcareous materials.

Cement is the main substance of concrete which is mixed with water and a series of actions and reactions called "Hydration" result is "gelation" that is a kind of paste. This pasty mixture surrounds the big and tiny grains of sand and gravel and stick them together to produce cement from lime stone (Ca<sup>o</sup>). Suitable proportions of sand (SiO<sub>2</sub>), aluminum oxid, clay and iron stone are used and after grinding, crushing and homogenizing, they are taken into special furnaces with temperature from 1400 to 1650°C. The result of these actions is bullets called "clicker" whose diameter is 3-4 centimeters. Clickers are then smashed and ground. Later some plaster is added to the result in order to adjust the hardening period of cement (1, 8).

Suffian cement factory use iron stone, lime stone and silica to produce cement. The personnel of this factory work in different parts of the factory such as, management staff department, ware house, protection and security, exploitation and mine affairs, stone grinder, grinding the crude materials and primary materials of the cement,

including calcareous materials containing cao, clay materials containing minerals with SiO<sub>2</sub>, aluminum and Fe<sub>2</sub>O<sub>3</sub>. The workers who work at furnaces and are responsible for mobile maintenance and electricity and those who work in manufacture and rebuilding department not only receive the cement dust, but also have contact with physical traumas and different chemical and oil materials. The cement grinder workers, the workers of mechanic and loading section are always in contact with cement dust. The bricklaying unit workers are also in contact with dry and wet cement.

The chemical formula used in the cement of this factory was evaluated. The most significant existing allergens were chromium, cobalt and nickel. Of course some quantities of chromium are carried into cement ingredients by grinding and silo equipments and the equipments which are used to powder and homogenize the materials. This causes the chromium density to increase in cement. Water analysis used in this factory indicates a lot of calcium (Ca<sup>++</sup>) and magnesium (Mg<sup>++</sup>) ions and this water is classified as sulfated waters of sedic and chlorosedic which are very hard and also contain main and branch harmful elements for the skin.

This is a descriptive survey from the point of statistics whose research society is the workers of suffian cement factory and descriptive statistics have been used to describe the inputs. The input tools are the workers' questionnaires and the observing the workers' medical examinations.

Input analysis method: The inputs or information have been analyzed by a software called spss, and statistic test has been used to compare the two comparative sides in order to determine the dermatitis affecting percentages due to cement for the working environment and the area of complication and the workers' ages separately.

## RESULTS

In this survey 153 workers out of 542 were affected with dermatitis. The affected workers from the point of age division are divided into eight 5 years age groups. The rate of affection in terms of the relation between their ages and dermatitis prevalence is as follows:

In the age group 20 - 25 the affection rate is 16.66 %. In the age group 26- 30 the affection rate is 20.40 %.

In the age group 31 - 35 the affection rate is 29.57 %.

In the age group 36 - 40 the affection rate is 24.27 %. In the age group 41- 45 the affection rate is 28.56 %.

In the age group 46 - 50 the affection rate is 29.41 %.

In the age group 51- 55 the affection rate is 29.16 %.

In the age group 56 - 60 the affection rate is 38.46 %.

And totally, the average dermatitis affection has been 27.06 %.

**Table 1-** The relation between the work period and the workers' affection with dermatitis in suffian cement factory .

The length of work period in the factory / year	0-5	6-10	11-15	16 - 20	21- 25	26-30
Total number of workers	77	22	91	252	98	2
The number of workers affected with dermatitis	16	5	29	73	28	2
The percentage of workers affected with dermatitis	20.8 %	22.7 %	31.9 %	30 %	28.6 %	100%

The relation between the work period in the factory and affection with dermatitis have been shown in table -1. According to this table those who have a longer work period their dermatitis rate is higher ( $p < 0.05$ ). From the point of workers contact view with cement 91 workers have had direct contact (59.5 %) and 62 workers have had indirect contact with cement (40.5 %). The lesion location in 46 patients have been in covered parts of the body but in 111 patients the lesions location have been in cover less parts of the body ( $p < 0.05$ ). The way of skin lesion spreading in these patients have been shown in table -2 . According to this table the most prevalent place of complication is the palms and the least prevalent place of complication has been ear

( $p < 0.05$ ). Regarding the disease symptoms, 71 patients had crack and fissure on their skin (46.4 %). Erythema was seen in 65 patients (42.48 %). 58 Patients suffered from exfoliation 37.90 %. Maculae was seen in 50 patients (32.67 %) and vesiculae in 9 patients (5.88 %). 9 patients had plaque (5.88 %) and crust was noticed in 6 patients (3.92 %).

Table-3 shows the relation between disease breakout and the type of work. According to this table the most prevalent dermatitis has been among the workers of loading unit (35 workers ) and the least prevalent dermatitis has been among the workers of stone grinding unit (One worker ).

**Table - 2.** The way of skin lesion outbreak spreading from an anatomic point among the patients affected with dermatitis in the workers dermatitis in the workers of Suffian cement factory.

Lesion location	The number of patients affected with the lesion in specified location	The percent of affected patients in specified location
Extensive ( disseminated)	4	2.6 %
Fingers	19	12.4%
Palm	63	41.2%
Forearm	10	6.5 %
Back of hand	10	6.5 %
Elbow	2	1.3 %
Arm	6	3.9 %
Axilla	4	2.6 %
Toes (foot fingers)	7	4.6 %
Ankle and back of foot	9	5.9 %
Leg	13	8.5 %
Knee	2	1.3 %
Thigh	2	1.3 %
Inguinal	2	1.3 %
Head skin (scalp)	7	4.6 %
Face	13	8.5 %
Lids	8	5.2 %
Ear	1	0.7 %
Nose	3	2 %
Mucous	4	2.6 %
Neck	7	4.6 %
Trunk	6	3.9 %
Abdomen	10	0.7 %
Genital	2	1.3 %

**Table - 3.** The relation between disease out break and work type among the workers of suffian cement factory .

Work site	Total workers	Patients per unit	The percent of patients in each unit	Percent of patient by total patients
Drivers	49	12	24.5 %	7.8 %
Stone grinder	10	1	10 %	0.7 %
Raw material grinding	39	14	35.9 %	9.2 %
Furnace	53	9	17 %	5.9 %
Cement grinding	19	3	15.8 %	2 %
Brick laying	24	8	33.3 %	5.2 %
Crane	11	0	0 %	0 %
Compressor and steam boiler	18	4	22.2 %	2.6 %
Lubricator	12	5	41.7 %	3.3 %
Mobile repairs	66	22	33.3 %	14.3 %
Transportation repairs	27	9	33.3 %	5.9 %
Loading unit	56	35	62.5 %	22.8 %
Laboratory	14	2	14.3 %	1.3 %
Electrician	57	14	24.6 %	9.2 %
Renovation and turnery	26	2	7.7 %	1.3 %
Manufacture section	19	4	21.1 %	2.6 %
Installations	19	6	31.6 %	3.9 %
Offices and ware house	23	3	13 %	2 %
Total	542	153	28.2 %	100%

## DISCUSSION

According to the obtained results the rate of dermatitis prevalence of cement is 28.2%. In a similar study carried out in Denmark, the rate of dermatitis break out of cement has been 23% (1). There is a direct relation between the workers age increasing and creation of dermatitis. There is also a direct relation between the contact period with cement and the rate of involvement to dermatitis. As the contact period with cement increases, the involvement rate also increases. Those who have been directly engaged with cement have had a higher affection to dermatitis (1,3). The rate of affection to dermatitis has increased in exposed locations of the body which have been without protection (1,4). There is also a meaningful relation between the handling of the work and the rate of dermatitis complication so that in

the workers of loading unit that are in direct contact with cement dust and suffer from the perspiration and some other factors of closed environment , the rate of involvement is about 62.5% but the rate of disease prevalence among the workers of renovation and turnery units who don't have such contact with cement is low (1,2). With due attention to the relative observance of work safety and sanitation in this factory and high rate of dermatitis break out among workers and their contact with cement dust, it can be predicted that the workers that are in frequent and constant contact with cement but have a low work sanitation will have a higher rate of dermatitis complication.

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