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EXPOSURE TO FLOUR DUST AND THE LEVEL OF ABRASION OF HARD TOOTH TISSUES AMONG THE WORKERS OF FLOUR MILLS

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Abstract: A study of the oral health of workers in flour mills was carried out. The examined group consisted of 40 males and 8 females currently employed at flour mills. As much as 93.75% of the workers showed evidence of dental abrasion, particularly of the front teeth. The authors concluded that the dental abrasions in the group are closely related to the work environment.

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INTRODUCTION

The work environment seriously influences the organism of exposed humans, including the oral cavity [5]. The workers of agricultural industry are highly exposed to harmful elements in their work environment, such as: dust, unfavourable microclimatic condition, excessive noise and insufficient light. From the above- mentioned factors, dust is treated as the most influential; it is perceived as a frequent cause of chronic illnesses of the human respiratory system. Grain or flour dust is released into air, and is later inhaled during industrial processes such as cleaning, packaging, reloading and crumbling of the product. Dust consists of fine particles that may be analysed from a physical, chemical, and biological point of view. In the air of flour mills organic dust occurs with a low level of silica and the high level of epiphytic microorganisms (bacteria, actinomycetes, fungi) and their products (endotoxin, mucopeptides, enzymes and other proteins) [7]. The dust adhering to teeth surfaces and a gum edge creates a specific coating, which causes tooth's earlier abrasion.

Slow, but progressing with age, the abrasion of incisive margins and dental tuberculum is a physiological process leading even to abrasion of the tooth. In a pathological abrasion, the process applies to groups of teeth or even to all teeth. Abrasion applies to dental tuberculum, incisive margins and often tooth buccal surface [2]. Since this subject has not received much attention, we have attempted to evaluate the influence of the mill work environment on the oral health condition of the patients.

The aim of this paper was the evaluation of hard tooth tissues among the workers of flour mills exposed to harmful factors during production processes.

MATERIALS AND METHODS

The research was carried out among 48 workers of three mill plants situated on the territory of Lublin region. The group consisted of 8 women and 40 men aged 20–50 years, coming from villages and towns. The examination of the oral cavity was carried out with the aid of a probe and a mirror, by artificial light. Special attention was paid to the abrasion of teeth, evaluated according to Martin's scale, as given below:

class 0 - no abrasion,
class 1 - abrasion of enamel,
class 2 - abrasion with revealed dentine,
class 3 - abrasion of dental occlusion,
class 4 - abrasion of a tooth's crown to the point of revealed tooth's neck,
class 5 - abrasion with the tooth's chamber opened.

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Table 1. Characteristics of examined group by gender and domicile.

Environment	Females	Males	Total
Urban	8	23	31
Rural	0	17	17
Total	8	40	48

Table 2. Characteristics of examined group by job duration.

Job duration (years)	Females	Males	Total
1–10	2	27	29
11–20	3	9	12
21–30	3	4	7

Table 3. Number (n) of teeth with abrasion by job duration.

Job duration	Examined persons	Teeth with abrasion			
		Maxilla	Mandible	Maxilla	Mandible
years	n	n	n	mean	mean
1–10	29	70	124	2.41	4.28
11–20	12	30	73	2.50	6.08
21–30	7	11	43	1.75	6.14

Table 4. The level of teeth abrasion in the examined group according to Martin's scale.

Abrasion class	Number of teeth with abrasion		
	Maxilla	Mandible	Total
1	80	115	195
2	25	102	127
3	6	23	29

The results were written in a code on specially prepared cards.

RESULTS

The characteristics of the examined group by gender and place of residence is presented in Table 1. Among 31 persons from towns there were 8 women and 23 men. The subgroup from villages was exclusively men (17 persons).

Table 2 presents the examined group depending on job duration. The most numerous group was that of people working for up to 10 years - 29 persons. Twelve people (9 men and 3 women) worked in mill plants for a period of 11–20 years. Finally, the least numerous group (7 persons - 3 women and 4 men) consisted of people working in flour mills for 21–30 years.

Tooth abrasion was present in 93.75% of the examined people. On average, each person had 7.31 teeth with pathological abrasion (2.31 teeth in maxilla and 5 teeth in mandible).

Table 3 presents the number of teeth with abrasion depending on job duration in mill plants. Since only a few women were examined, the analysed material was not been divided according to gender. In the first group (1–10 years of employment) there were on the average 2.41 teeth with abrasion in maxilla and 4.28 in mandible. The second group (11–20 years of employment) had 2.5 teeth with abrasion in maxilla and 6.08 in mandible. The biggest number of teeth with abrasion in mandible (6.14) was found in the third group (21–30 years of employment). However, this group had on average only 1.57 teeth with abrasion in maxilla.

The level of abrasion according to Martin's scale is shown in Table 4. The changes classified as class 1 (abrasion of enamel) were most common, both in maxilla - 80 teeth, and in mandible - 115 teeth. Abrasion with revealed dentine (class 2) was observed in 25 teeth in maxilla and in 102 teeth in mandible. Within class 3 (abrasion of dental occlusion) there were 6 teeth in maxilla and 23 teeth in mandible. In the examined group there were no abrasion teeth within 4 and 5 class of Martin's scale.

Taking into account the groups of teeth, the teeth most frequently damaged by abrasion were incisors: 69

Table 5. The level of teeth abrasion according to Martin's scale by groups of teeth.

Abrasion class	Number of teeth with abrasion								Total
	Maxilla				Mandible				
	I	C	P	M	I	C	P	M	
1	48	18	10	4	68	31	11	5	195
2	17	4	2	2	60	28	10	4	127
3	4	2	0	0	17	3	1	2	29
Total	69	24	12	6	145	62	22	11	351
Percent (%)	19.66	6.84	3.42	1.71	41.31	17.66	6.27	3.13	100

I - incisor; C - canine; P - premolar; M - molar.

(19.66%) in maxilla and 145 (41.31%) in mandible (Tab. 5). Canine teeth and premolar teeth were damaged by abrasion almost to same degree. Molar teeth were those least damaged by abrasion: 6 teeth (1.71%) in maxilla, and 11 teeth (3.13%) in mandible.

DISCUSSION

Harmful, mechanical effects of industrial dust frequently cause earlier, pathological teeth abrasion [3]. In the examined group, 93.75% of the millers had injury of hard teeth tissues classified as a pathological abrasion of teeth. Only 6.25% of the workers did not have such symptoms. It can be stated that the length of employment correlates with injury of hard teeth tissues. The longer people work (longer job duration) the more teeth with pathological abrasion they have. This is probably connected with the mechanical effects of flour dust on hard teeth tissues (earlier abrasion) [3].

The harmful influence of dust has already been examined by Petersen and Henmar [6] who found that all the workers of the Danish Granite Industry had pathological abrasions in anterior teeth. The results from our research were very similar, and it was shown that incisors of the mandible and maxilla were most often damaged by abrasion. Larsen [4] also observed abrasion changes among people exposed to inorganic dust in the work environment.

Nevertheless, abrasion teeth are also observed in persons not exposed to dust. Among a random sample of inhabitants of Kraków province there were 50% of people with such changes [1].

CONCLUSIONS

1. The results of research carried out indicate that flour dust can have an impact on hard teeth tissues.
2. In the examined group of millers, pathological abrasion of teeth was observed in 93.75% of workers.
3. A long exposure to dust (long job duration) can lead to earlier teeth abrasion.
4. In the examined group, incisors (both in maxilla and mandible) were most frequently changed by abrasion.
5. Health protection of millers (belonging to workers with high occupational hazard) should include not only general medical protection but also dental prevention and treatment.

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