

Lung Function Disturbance Based on Student Characteristic in Surabaya Dental Laboratory

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Diterima : 15 Agustus 2017

Layak Terbit : 19 Desember 2017

Abstract

The dental technician program of Airlangga University teaches and trains aspiring dental technicians. During three years of study, students manufacture dental prostheses such as cobalt chromium coping and acrylic dentures and perform other procedures, such as crown and bridge restoration. However, the use of dental prostheses material might cause respiratory diseases, skin problems, and neurotoxicity. Few respiratory diseases have been reported related to the occupation of dental technician, and epidemiology studies have shown high prevalence of pneumoconiosis linked with exposure duration. Lung function disturbance severity in dental laboratories is affected by some factors, such as the characteristics of workers in such a setting. This study aims to investigate the lung function representation of students of the dental technician program of Airlangga University in relation to student characteristics in the dental laboratory. This study is an observational descriptive study. Data are obtained by using a questionnaire and a literature review, and lung physiological examination is conducted using spirometry. Examination data results are presented in the form of a ratio scale and analyzed by using descriptive statistics. Conclusion: No significant difference in lung function was observed between smokers and non-smokers and between mask-wearers and non-mask-wearers.

Keywords: dental laboratory, dental technician, lung function, characteristic

Abstrak

Gangguan Fungsi Paru Berdasarkan Karakteristik Siswa di Laboratorium Gigi Surabaya. Program Vokasi Teknisi Kedokteran Gigi Universitas Airlangga adalah lembaga pendidikan yang menghasilkan teknisi gigi. Selama 3 tahun masa studi, siswa melakukan pembuatan protheses gigi seperti restorasi mahkota dan jembatan, kromium kobalt, gigi tiruan akrilik dan lainnya. Pemanfaatan material protheses gigi dapat menyebabkan penyakit pernafasan, masalah kulit dan neurotoksisitas pada teknisi gigi. Beberapa penyakit pernafasan telah dilaporkan terkait dengan penelitian pendudukan dan epidemiologi ini menunjukkan prevalensi tinggi terhadap pneumokoniosis terkait dengan durasi paparan. Paru fungsi gangguan gangguan pada laboratorium gigi dipengaruhi oleh beberapa faktor, misalnya karakter pekerja di tempat tersebut. Penelitian ini bertujuan untuk mengetahui representasi fungsi paru siswa pada Fakultas Staf Teknik Gigi Universitas Airlangga yang berkaitan dengan karakteristik siswa di laboratorium gigi. Penelitian ini merupakan penelitian deskriptif observasional, data diperoleh dari kuisioner, pemeriksaan fisiologis paru dengan menggunakan spirometri dan studi pustaka. Hasil data pemeriksaan berupa skala rasio dan telah dianalisis dengan statistik deskriptif. Kesimpulan: Tidak ada perbedaan yang signifikan antara kebiasaan merokok-rokok dan masker yang memakai kebiasaan-non topeng dengan memakai kelompok kebiasaan untuk fungsi paru-paru.

Kata Kunci: laboratorium gigi, teknisi gigi, fungsi paru, karakteristik

INTRODUCTION

Tooth rehabilitation appliances and prostheses are fabricated in dental laboratories to support optimal patient treatment by dentists. Various materials are used for crown and bridge restoration and to manufacture different prostheses such as cobalt chromium framework and acrylic denture. Metal alloy

base is widely used as casting material for metal core construction in metal ceramic restoration construction (NiCr) and metal framework construction (CoCr) for dental prostheses. The use of such materials may cause respiratory problems, skin diseases, and neurotoxicity. Few respiratory problems have been reported in this specific occupational group, and

epidemiology studies have shown high prevalence of pneumoconiosis related to exposure duration (Hu et al, 2006). Dental technicians may be exposed to substances such as the metal of base metal alloys and other materials that are used in dental prostheses fabrication.

Unfavorable working conditions, such as a dusty dental laboratory, may pose difficulties in completing tasks, damage products or machines, and harm dental technicians. Industrial dust with a size of 3 to 10 μm may be embedded in the lungs. Prolonged exposure to dust may result in cilia paralysis, hypersecretion, and mucous gland hypertrophy. Such conditions can make the respiratory tract prone to infection and cause chronic prolonged cough. Cobalt, nickel, and chromium exposure result in acute or chronic symptoms, such as nausea, vomiting, stomach discomfort, diarrhea, eyesight problems, headache, dizziness, chest pain, respiratory problems, and cough. Inhaling dust may lead to lung function disturbance. Lung function disturbance in dental laboratory workers may also be caused by a smoking habit. Smoking is a common habit among many people in Indonesia, including dental technicians. Some compounds in cigarettes may harm the lung condition of people.

One way to protect against dust particle exposure in a dental laboratory is to wear protective gear, such as a mask. The use of soft-fabric masks aims to prevent the inhalation of dust particles. However, not all dental technicians wear masks while working in dental laboratories because of many reasons.

This study aims to investigate lung function disturbance based on student characteristics, namely, smoking and mask-wearing, in a dental laboratory.

MATERIALS AND METHODS

This study is a descriptive observational study. Data sampling and lung function examination were performed in June 2016 in a well-known clinical laboratory in Surabaya.

The study population is composed of students who are in their second, fourth, and sixth semester of the dental technician program of Airlangga University. They work in a dental laboratory to practice building dental prostheses. The sample was chosen randomly. Fifteen students from each semester group were chosen. As a control group, 15 dental medicine students from Airlangga University were selected (Table 2). A total of 60 students had a smoking habit. All participants expressed willingness to follow the study protocol.

Table 1. Lung function examination

		LUNG FUNCTION			p
		ABNORMAL	NORMAL	TOTAL	
MASK WEARING HABIT	ALWAYS	12 (52.2%)	11 (47.8%)	23 (100%)	.641
	SOMETIMES	13 (59.1%)	9 (40.9%)	22 (100%)	
TOTAL		25 (55.6%)	20 (44.4%)	45 (100%)	

Table 2. Difference in percentage between students with a smoking habit and abnormal lung function

		LUNG FUNCTION			p
		ABNORMAL	NORMAL	TOTAL	
SMOKING HABIT	YES	14 (53.8%)	12 (46.2%)	26 (100%)	.330
	NO	14 (41.2%)	20 (58.8%)	34 (100%)	
TOTAL		28 (46.7%)	32 (53.3%)	60 (100%)	

Data sampling from primary and secondary data was conducted by distributing a questionnaire among all the participants. The questionnaire contained items on personal data, symptoms, and history of disease. Lung function examination was performed in a clinical laboratory considering FEV1 and FVC.

Table 2 showed a slight difference in percentage between students with a smoking habit and an abnormal lung function (53.8%) against students with a smoking habit and a normal lung function (46.2%). Students with no smoking habit showed a lower

percentage (41.2%) of abnormal lung function compared with students with a normal lung function.

Dust in thick air increases the possibility of lung function disturbance. Silica dust in dental laboratory is 0.5–7.3 μm in diameter (Inayati, 2015). The size and diameter of dust affect function disturbance. A small dust size means that the dust can penetrate lung tissue and reach the alveoli. Silica dust is an anorganic dust that is more reactive and more easily causes irritation than organic dust.

Some students involved in this study have a smoking habit. The smoking duration and the number of cigarettes smoked are not the same. Tables 2 and 5 showed no significance difference between smoking and the parameters. The data were analyzed by using the chi-square test.

Table 3. Percentage of mask-wearing group to lung function affected by dust in the dental laboratory if dental labs have poor ventilation and do not have a dust collector.

No	Characteristic		Control		Semester II		Semester IV		Semester VI	
			n	%	N	%	n	%	n	%
1	Smoking habit	Yes	0	0	2	13.33	1	6.67	2	13.33
		No	15	100	13	86.67	14	93.33	13	86.67
2	Mask usage	Always	0	0	6	40	8	53.33	10	66.67
		Sometimes	0	0	9	60	7	46.66	5	33.33
		Never	15	100	0	0	0	0	0	0

RESULT AND DISCUSSION

DISCUSSION

Pulmonary function tests can be conducted for early detection of lung disease and respiratory problems to prevent any disease from worsening. A

spirometer is used to check lung function with FEV1 and FVC examination, which is simple, informative, and meaningful when assessing the progress of the disease (West, 2010).

Prostheses made of various materials such as acrylic resins, gypsum, NiCr alloys, and dental ceramics are manufactured in dental laboratories. The manufacturing process involves grinding, polishing, sandblasting, and finishing, which produce dust, thereby resulting in non-smokers having the same condition as smokers who smoke 3 to 10 cigarettes per day for 1 to 2 years. This result is in accordance with Abakay et al. (2013), who found no significant difference between the control group and the smoking dental technician group in terms of respiratory function disturbance and rontgenologic abnormality. The result is also consistent with Kahraman et al. (2014), who found no significant difference among smokers with impaired lung function. Even though the figure is not statistically significant, students with a smoking habit showed a higher percentage of having lung function disturbance compared with non-smoking students. Cigarettes contain nicotine, which can create sediments in the lung and thereby alter lung function. Heavy smoking causes more sediments to form in the lungs, thereby constricting the airway channel (Solihah and Tualeka, 2015).

No significant difference in lung function was found between students with a mask-wearing habit and students who sometimes wear masks. This result is in accordance with Damayanti et al. (2007), who found no relationship between mask-wearing and physical disturbance, lung function, and thoracic among rontgen workers exposed to building material dust. The non-mask-wearing group showed decreased lung function; however, such decrease was not statistically significant.

Respiratory tract disturbance indicates the presence of lung function disturbance, obstruction, restriction, or a combination of all. Imaduddin (2012) and Saputra and Haryono (2016) found no relation between mask-wearing and the respiratory tract condition of workers in PT Madubaru Bantul.

Some students wear masks while working in dental laboratories only occasionally, thereby showing a lack of awareness of the importance of wearing masks to protect against disease. Some students dislike wearing masks because masks are uncomfortable in humid weather and are restrictive. Hutama (2013) found that people do not wear masks if they are working in a hot and humid area. Some students who always wear masks also show abnormal lung function, possibly because they use masks incorrectly, thereby exposing them to dust even with the mask on. Teaching students

about the importance of wearing masks and their proper use while working in a dental laboratory is important.

CONCLUSION

No significant difference in lung function was observed between smokers and non-smokers and mask-wearers and non-mask-wearers.

REFERENCES

- A. Abakay, S. Atilgan, O. Abakay and A.C. Tanrikulu, "Frequency of respiratory function disorders among dental laboratory technicians working under conditions of high dust concentration." *Medical and pharmacological sciences* 2013, vol.17 (6) pp. 809-14.
- A. Imaduddin, "Hubungan karakteristik pekerja dengan keluhan Gangguan pernapasan akibat paparan debu kapas." Skripsi. Surabaya: Universitas Airlangga, 2012.
- A.P. Utama, "Hubungan antara masa kerja dan penggunaan alat pelindung diri dengan kapasitas vital paru pada pekerja unit Spinning I Bagian Ring Frame PT Pisma Putra Tekstil Pekalongan." *UJPH* 2013, vol.2 (3) pp. 1-7.
- A.S. Al-Hiyasat, H. Darmani, "The effects of recasting on the cytotoxicity of base metal alloys," *J Prosthet Dent* 2005 vol 93 pp 158-163.
- E. Inayati, S. Salim, S. Harwasih and S.R. Indiani, "Levels of crystalline silica dust in dental laboratorium of Dental Health Technology Study Programe of Vocational Faculty, Universitas Airlangga." *Dental Journal* 2015, vol.48 (4) pp. 183-7.
- F. Yunus, "Diagnosa Penyakit paru kerja." *Cermin Dunia Kedokteran* 1991, No.70 pp. 18-23.
- H. Kahraman, N. Koksai, M. Cinkaara, F. Ozkand, M.H. Sucakli and H. Ekerbicer, "Pneumoconiosis in dental technicians: HRCT and pulmonary function findings." *Oxford Journals Medicine & Health Occupational Medicine*, 2014, vol. 64 (Issue 6) pp. 442-7.
- I. Budiono, "Faktor resiko gangguan fungsi paru pada pekerja pengecatan mobil (studi pada bengkel pengecatan di kota Semarang)," Tesis, UNDIP: Semarang, 2007.
- J. West, "Patofisiologi paru esensial." Edisi 6, Penerbit Buku Kedokteran EGC, Jakarta, 2010.
- K.J. Anusavice, C. Shen, H.R. Rawls. "Philips' Science of Dental Materials," 12th ed. St.Louis:Saunders, 2003.
- M.A. Al Awadeen, A.S. Al Hiyasat, A.M. Massadeh and Y.S. Khader. "Determination of selected heavy metal levels in scalp hair and fingernail samples from dental laboratory technicians." *J Interdiscipl Med Dent Sci*. 2014, Vol 2(5). pp 1-7.
- M. Sholihah and A.R. Tualeka, "Studi faal paru dan kebiasaan merokok pada pekerja yang terpajan debu pada perusahaan konstruksi di Surabaya." *The Indonesian Journal of Occupational Safety and Health* 2015, vol. 4 (1) pp. 1-10.
- N. Hariyani, T. Berniyanti and D. Setyowati D, "Effect of occupational environmental control the level of Co, Ni and Cr among dental technicians." *International Journal of Environmental Science and Development* 2015, vol. 6 (9) pp. 643-7.
- R. Saputra R and W. Hariyono, "Hubungan masa kerja dan penggunaan alat pelindung diri dengan keluhan gangguan saluran pernafasan pada karyawan di PT Madubaru Kabupaten Bantul." *Seminar Nasional IENACO*. 2016 ISSN: 2337-4349, pp.58-63.
- S. Burgaz, G.C. Demircigil, M. Yilmazer, N. Ertas, Y. Kemalglu Y, "Assessment of cytogenetic damage in lymphocytes and in exfoliated nasal cells of dental laboratory technicians exposed to chromium, cobalt, and nickel." *Mutat Res* 2002, vol 26 pp. 47-56.
- S. Yulaekah S, "Paparasi debu terhirup dan gangguan fungsi paru pada pekerja Industri batu kapur." Tesis. Semarang: Universitas Diponegoro, 2007.
- T. Damayanti, F. Yunus, M. Ikhsan and K. Sutjahyo, "Hubungan penggunaan masker dengan gambaran klinis, faal paru dan foto toraks pekerja terpajan debu semen." *Maj.Kedokt Indon* 2007, vol.57 (9) pp.289-99.