IJBPAS, February, 2017, 6(2): 316-325

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

SPIROMETRIC EVALUATIONOF LUNG FUNCTION OF CARPENTERS IN QUETTA DISTRICT OF BALOCHISTAN, PAKISTAN

ABDUL RAUF BUGTI[1], MUHAMMAD YOUNIS[1], JAHNZAIB[5], SHAFI MUHAMMAD[2*], TANZEEL AHMED[4], QAISER IQBAL[3], ABDUL JABBAR[2], MUHAMMAD WAQAS[6]

1. Department of Pharmacology, Faculty of Pharmacy and Health Sciences, University of Balochistan, Quetta-Pakistan

2. Department of Pharmacognosy, Faculty of Pharmacy and Health Sciences, University of Balochistan, Quetta-Pakistan

3. Department of Pharmaceutics, Faculty of Pharmacy and Health Sciences, University of Balochistan, Quetta, Pakistan

4. Department of Pharmacy Practice, Faculty of Pharmacy and Health Sciences, University of Balochistan, Quetta, Pakistan

5. Department of Physiology, Bolan Medical collage Quetta, Pakistan.

6. Department of Pharmacy and institute of pharmaceutical Sciences and Technology, Hanyang University, Republic of Korea.

***Corresponding author: Pharmacognosist59@yahoo.com**

Received 12th Sept. 2016; Revised 19th Oct. 2016; Accepted 19th Dec. 2016; Available online 1st Feb. 2017

ABSTRACT

Objective: The study was designed to assess the effect of wood dust on pulmonary system of carpenters.

Methodology: The total number of 100 male carpenters age ranging from 18-50 years, more than one year work experience was randomly selected from the wood industries in Quetta district, Pakistan. Data was collected by using self-questionnaire based on interview and Spirometric tests were carried out. Forced vital capacity (FVC), Forced expiratory volume over

the first second (FVE1) and FEV1/FCV ratio were observed and analyzed. To find statistically significant difference between the mean of percentage predicted for exposure groups by ANOVA test ($P < 0.05$) was observed on post hoc analysis (Tukey's multiple comparison analysis) by using SPSS 22.

Result: The total 100 carpenters were selected and divided in to four categories of age groups. The mean of percentage predicted for (FVC) the group exposed to wood dust for less than 5 years was 57.8, exposure group 5-15 years the value was 63.63 and in exposure group 15 years &> was 59.12. The mean of percentage predicted for (FEV1) in less than 5 years exposure group was 58.77, in exposure group 5-15 years was 67.29 and in exposure group 15 years &> was 67.15. The mean of percentage predicted for FEV1/FVC in exposure group < 5 years was 94.04, in exposure group 5-15 years was 94.23 and in the exposure group 15 years &> was 89.74 %.

Conclusion: The finding of this study determined that the wood dust adversely affects the Pulmonary System and this damage is linked with the duration of exposure to wood dust. The study population related to the wood industries workers affected with the restrictive lung disease.

Keywords: Forced Vital Capacity, Forced Expiratory Volume over First Second, Pulmonary Function Test, Wood Dust, Spirometer, Carpenters.

INTRODUCTION:

The Wood dust has long been connected by a variation of respiratory symptoms, including asthma, chronic bronchitis and rhino conjunctivitis [1]. Respiratory diseases due to the inhalation of wood dust have formerly been defined and have been attributed to mechanical irritation [2, 3]. In the European Union approximately 3.6 million employees are exposed to wood dust [4].Wood is one of the maximum vital renewable incomes in the world and increases over approximately one third of the earth's total landmass about 3.4 million and at least1700 million are cultivated for industrial usage every year [5].

The industries in which a great quantity of wood dust is formed contain sawmills, dimension mills, cabinet making, furniture industries, and carpentry [5]. Wood dust is a light brown or tan fibrous powder resembling substance produced when wooden is processed, while it is chipped, sawed, turned, drilled, or polished [5]. Exposure to wood dust has long been associated with a variety of adverse health effects, including dry cough, malaise, chronic bronchitis, shortness of breath, chest pain, conjunctivitis, rhinitis, dermatitis, occupational asthma, allergic alveoli, headache and lung function deficits

[6-9]. The (ONAP) Observatoire National des Asthmes Professionnels stated that the maximum dangers of job-related asthma were found for car painters, bakers and pastry makers, carpenters, and woodworkers[10, 11]. Pulmonary function is also reduced in persons exposed to tea and wood dust [12]. Carpenters have been shown to be susceptible to developing asthma associated to their work [13].

The Study among 685 carpenters in Thailand presented significant negative relations between mean dust exposure levels and FVC and FEV1/FVC ratio but not FEV1, which recommends that wood dust exposure destructively affects lung function[14]. Spirometry is a valuable instrument to help the practitioner differentiate standard from nonstandard pulmonary function describe obstructive from restrictive faults and display the illness or management[2]. Most hospitals and many specialty offices (for example; allergy and pulmonology) have ready access to and awareness with spirometry [2].The purpose of present study was to measure the consequence of wood dust on pulmonary system of carpenters and the effects of exposure length to wood dust on their pulmonary system.

MATERIALS AND METHODS:

The material and methods of the study as follows;

Study Design:

This study was an observational study defining the impact of wood dust on pulmonary system of carpenters.

Study Setting:

The study was conducted in Quetta district working under the Government of Balochistan, Pakistan.Balochistan is situated in the southwest of Pakistan and covers an area of 347,190 square kilometres (134,050 sq. mi). It is Pakistan's largest province by area constituting 44% of Pakistan's total land mass. The Quetta is the largest populated district of Balochistan. The population of Quetta district is about approx. 1140 million. The total number of carpenter shops / wood industries are 125 approx. and there 250 carpenters currently working approximately.

Study Population:

The male carpenters were selected from the Quetta district of Baluchistan, Pakistan.

Sample Selection Criteria:

The random sampling from the carpenters shops/ wood industries in the Quetta district of Balochistan, Pakistan.

Sample Size:

The total number 100 carpenters were randomly selected.

Inclusion Criteria:

The age groups18-50 years who had one year worked experience were included in this study.

Exclusion Criteria:

The study population who has less than 18 years and less than one year work experience were excluded.

Data Collection Instruments:

The data collection instruments were questionnaire and Spirometer as follows; a self -questionnaire, based on interview containing two parts; (1).Demographics; age, sex, place of birth, academic qualification and work experience. (2).General physical examination; weight, height, BMI, pulse rate, blood pressure, anemia, respiratory system, cardio vascular system, urinary system, nervous systems and miscellaneous. Spirometer; the parameters FVC, FEV1, PEF and FEV1/ FVC ratio.

Study Procedure:

The interview conducted on the carpenters of the Quetta district and recorded data in the data collection form (Questionnaire) and spirometric tests (FVC, FEV1, PEF and FEV1/FVC) were calculated and analyzed by using spirometer.

Statistical Analysis:

The data was analyzed by using Microsoft Excel 2013 and to find frequency, mean, Standard deviation and standard error of mean were done by descriptive analysis and ANOVA testwas done ($P < 0.05$) observed on post hoc analysis (Tukey's multiple comparison analysis) by SPSS 22.

Ethical Consideration:

This study was authorized by the Ethics and Research Committee, faculty of pharmacy and health sciences, university of Baluchistan, Pakistan. Prior consent was taken from the carpenters of Quetta district, Pakistan. All carpenters were informed about the objective of the study.

RESULT:

The total 100 Car painter were selected and divided in to four categories; out of which Age group of 18-27 years were 55 (55.0%), followed by age group 28-37 years were 19 (19.0%), age group 38-47 years were15 (15%) and age group 48 years and above were 11 (11.0%). The maximum qualification of the study populations was FSc 4 (4.0%) and minimum qualification was un-educated 32 (32.0%).The experience group;<5 years' work experience was 26 (26.0%), followed by 5-15 years were 31(31.0%) and 15 years and > were 43 (43.0%), as shown in table no.01.

The evaluation of different diseases surveillance in the study population with different age groups as shown in table no.02.In the age group between 18-27 years there was only 01(1.8%) of anemic individual from the total study population followed by, age group 28-37 years were 04 (21.0%) and in age group 48 years and > were 03(0.2%).Population screening with respiratory disease there was only 01 (0.01%) in age group 18-27 years and in age group 28-37 years were02(0.1%).The disease related to the cardio vascular system, age group 38-47 years was 01(6.6%) and in age group 48 years&> were 02 (18.1%).The disease related to the urinary tract infections; age group 28-37years was 01 (1.2%) and in age group 38-47 years was 01(6.6%).In nervous system only 01(6.6%) was affected with the disease and in the age group 38-47 years.

The miscellaneous groups; the age group 48 years &>, there was an individual 01 (1.0%) that taken diabetes medicines and in age group 38-47 years there was only 01(1.0%) taking neuro medicines. The total number of 98% of study population were those which not taking any medicines as follows; age group 18-27 years were 55(56.0%), age group 28-37 years 19 (19.3%), age group 38-47 years were 15 (15.3%) and age group 48 years & above were 11(11.2%).

In the group exposed to wood dust for less than 5 years, the mean of percentage predicted for FVC (Forced vital capacity**)** was 57.8, for the group exposed to wood dust for FVC 5-15 years, the value was 63.63 and the mean of percentage predicted for FVC in the group exposed to wood dust for more than 15 years was 59.12.

The mean of percentage predicted for FEV1 (Forced expiratory volume over the first second)the group exposed to wood dust for less than 5 years was 58.77, for the group exposed to wood dust for 5-15 years was 67.29 and for FEV1 in the group exposed to wood dust for more than 15 years was 67.15.

For the group exposed to wood dust less than 5 years, the mean of percentage predicted for PEF (Peak expiratory flow) was72.62, for the group exposed to wood dust for 5-15 years for PEF was 77.70 and for PEF, the group exposed to wood dust for more than 15 years was 73.91.

For the group exposed to wood dust less than 5 years, the mean of percentage predicted for FEV1/FVC was 94.04, the group exposed to wood dust 5-15 years for FEV1/FVC was 94.23 and in the group exposed to wood dust for more than 15 years were 89.74. As shown in table 03.

To find statistically significant difference between the mean of groups ANOVA test was done ($P < 0.05$) observed on post hoc analysis (Tukey's multiple comparison analysis). The significance level being (FVC= 0.47, FEV1= 0.08, PEF=0.52 and FEV1/FVC=0.01) respectively.

Table 1: Characteristics of Study Population with Age Group, Qualification and Work Experience

Characteristics of Study Population		
Age Group	**Frequency (N=100)**	**Percent**
18-27	**55**	**55.0**
28-37	**19**	**19.0**
38-47	**15**	**15.0**
48>	**11**	**11.0**
Qualification		
FSc	**4**	**4.0**
Metric Middle	**14**	**14.0**
Primary	**22**	**22.0**
Hafiz e Quran	**25**	**25.0**
Un-Educated	**03**	**3.0**
	32	**32.0**
Work Experience		
Less than 5 Years	**26**	**26.0**
5-15Years	**41**	**41.0**
15 Years & Above	**33**	**33.0**

Table 2: Comparison of Diseases Affected Study Population in Different Age Groups

Diseases Frequency and Percentage of Population in Different Age Groups		
Age Groups	**Disease Affected Population**	**Percent**
Anemia		
18-27	**01**	**1.8**
28-37	**04**	**21.0**
48>	**03**	**0.2**
Respiratory		
18-27	**01**	**0.01**
28-37	**02**	**0.1**
CVS		
38-47	**01**	**6.6**
48>	**02**	**18.1**
UTI		
28-37	**01**	**5.2**
38-47	**01**	**6.6**
Nervous System		
38-47	**01**	**6.6**
Others;		
48> (Taking Diabetes Medicines)	**01**	**1.0**
38-47 (Taking Neuro Medicines)	**01**	**1.0**
Not Taking Medicines included;	**98**	**98.0**
18-27	**55**	**56.0**
28-37	**19**	**19.3**
38-47	**15**	**15.3**
48>	**11**	**11.2**

Table 3: Descriptive Analysis of Pulmonary Function Test with Different Exposure Groups

Descriptive Analysis of Pulmonary Function Test								
Description					**95% Confidence Interval for Mean**			
FVC	**N**	**M**	**SD**	**SEM**	**Lower Bound**	**Upper Bound**	**Minimum**	**Maximum**
Less than 5 Years	**26**	**57.08**	**16.466**	**3.229**	**50.43**	**63.73**	**25**	**92**
5-15Years	**41**	**63.63**	**29.099**	**4.544**	**55.45**	**72.82**	**35**	**218**
15 Years & Above	**33**	**59.12**	**16.441**	**2.862**	**53.29**	**64.95**	**28**	**89**
Total	**100**	**60.44**	**22.488**	**2.249**	**55.98**	**64.90**	**25**	**218**
FEV1								
Less than 5 Years	**26**	**58.77**	**16.200**	**3.177**	**52.23**	**65.31**	**22**	**81**
5-15Years	**41**	**67.29**	**15.764**	**2.462**	**62.32**	**72.27**	**40**	**100**
15 Years & Above	**33**	**67.15**	**16.965**	**2.953**	**61.14**	**73.17**	**33**	**97**
Total	**100**	**65.03**	**16.542**	**1.654**	**61.75**	**68.31**	**22**	**100**
PEF								
Less than 5 Years	**26**	**72.62**	**19.761**	**3.875**	**64.63**	**80.60**	**36**	**110**
5-15Years	**41**	**77.70**	**16.337**	**2.583**	**78.48**	**82.92**	**46**	**116**
15 Years & Above	**33**	**73.91**	**21.878**	**3.808**	**66.15**	**81.67**	**40**	**120**
Total	**100**	**75.10**	**19.157**	**1.925**	**71.28**	**78.92**	**36**	**120**
FEV1/FVC Ratio								
Less than 5 Years	**26**	**94.04**	**4.323**	**.848**	**92.30**	**95.79**	**78**	**98**
5-15Years	**41**	**94.23**	**2.410**	**.376**	**93.46**	**94.99**	**89**	**99**
15 Years & Above	**33**	**89.74**	**8.300**	**1.445**	**86.79**	**92.68**	**49**	**96**
Total	**100**	**92.70**	**5.805**	**.580**	**91.55**	**93.85**	**49**	**99**

***FVC = Forced Vital Capacity, *FEV1 = Forced Expiratory Volume in One Second,*PEF = Peak Expiratory Flow, *FEV1/FVC – Ratio of FEV1 and FVC, *BMI = Body Mass Index.**
***M = Mean, *SD = Standard Deviation and *SEM = Standard Error of Mean**

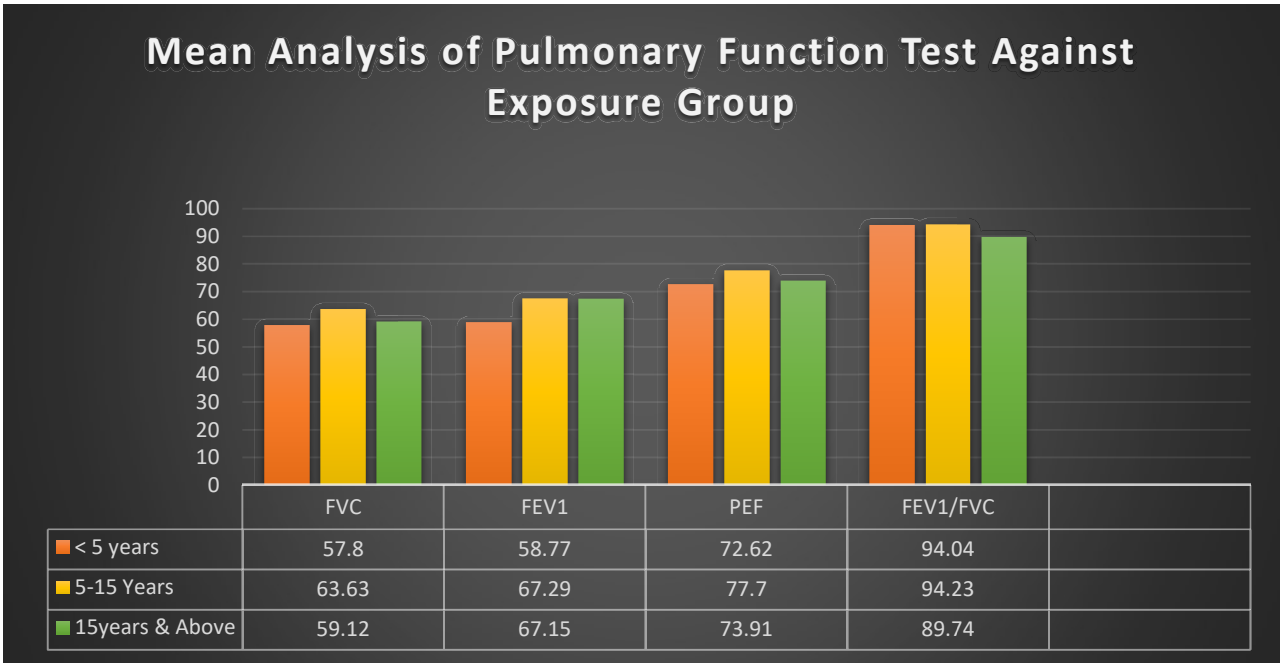

Figure 1: Mean Analysis of Pulmonary Function Test with Different Exposure Groups.*FVC = Forced Vital Capacity, *FEV1 = Forced Expiratory Volume in One Second,*PEF = Peak ExpiratoryFlow, *FEV1/FVC – Ratio of FEV1/FVC,

DISCUSSION:

The results of present study confirmed that the linked between exposure to wood dust and decreased FVC and FEV1 is directly proportional to the duration of exposure carpenters.

The group exposed to wood dust instudy of Vijay Kumar in< 5 years for FVC was 70.5, in the 5-10 years value was 69.3 and FVC in the group exposed to wood dust >10 years was 59.2[15]. But in present study the group exposed to wood dust in < less than 5 years the FVC was 57.08, the group exposed to wood dust for FVC in 5-15 years was 63.63 and the group exposed to wood dust for FVC in >15 years and above was 59.12.

The group exposed to wood dust in a study of Vijay Kumar in< 5 years FEV1 was 80.70, in the 5-10 years value was 71.87 and in the group exposed to wood dust >10 years was 65.33 [15]. But in present study the group exposed to wood dust in < 5 years FEV1 was 58.77, in the 5-15 years value was 67.29 and in the group exposed to wood dust >15 years and above was 67.15. The FEV1 is reduced in airway obstruction that can be caused by mucous secretion, bronchospasm and in inflammatory disorders like asthma or bronchitis [15]. FEV1 may also be reduced in large airway obstruction (trachea and bronchi),tumors or foreign bodies can also cause condensed FEV1[15].

The result of Vijay Kumar shows that the group exposed to wood dust less than 5 years for FEV1/FVC was 114.8, in 5-10 yearsFEV1/FVC was 111.63 and more than 10 years was 100.07[15]. But in the present study group exposed to wood dust less than 5 years for FEV1/FVC was 94.04, in 5-15 yearswas 94.23 and more than 15 years and above was 89.74 percent.

Study conducted by Bosan and Okpapi, verified significant obstructive pattern of damage in FEV1 and FVC among wood workers in the Savannah belt of Northern Nigeria[15] .But the findings of the present study also proved decrease of FEV1 and FVC in their predicted percentage.

The study conducted in Karachi by Meo, concluded that increased length of experience to wood dust reduced capacity of lung function [5]. The study also showed a significant difference in reduction of lung function in the workers exposed for more than 8 years [5]. In the current study substantial reduction in spirometer limits was established among exposure group to wood dust < 5 years and exposure group to wood dust for >15 years& above.

The result of present study supports the studies conducted by Vijay Kumar in

Mangalore, India, the study conducted in Karachi by Meo and study conducted by Bosan and Okpapi in Nigeria. The most widely used spirometric parameter is (FEV1) for calculation of airway obstruction [15].FEV1 is used in aggregation with FVC (Forced vital capacity) for diagnosis and FEV1/FVC is also stated as FEV1% [15]. If FEV1/FVC is lower than expected it can be considered as an indication of obstructive lung disease and if FVC and FEV1 are both reduced compared with the expected values and FEV1/ FVC is normal or high than consider restrictive lung disease [15]. As follows; > 80% = restrictive defect minimal obstruction, 65 - 80% = mild obstructive defect, 50 - 65% = moderate obstructive defect and < 50% = severe obstructive defect.

RECOMMENDATIONS:

The protective measures such as ventilated work areas and usage of suitable respiratory defensive devices. Before hire and episodic medical investigation tests in this work related group should be directed.

CONCLUSION:

The finding of this study determined that the wood dust adversely affects the Pulmonary System and this damage is linked with the duration of exposure to wood dust. The study population related to the wood industries workers affected with the restrictive lung disease.

LIMITATION:

This study only represents the carpenters of Quetta district of Baluchistan, Pakistan, does not represent the any other settings Baluchistan, Pakistan.

REFERENCES:

[1] Jacobsen, G., et al., *Longitudinal lung function decline and wood dust exposure in the furniture industry.* European Respiratory Journal, 2008. 31(2): p. 334-342.

[2] Kaslovsky, M. and M. Sadof, *Spirometry the primary care pediatrician.* 2014.

[3] Chan-Yeung, M., S. Lam, and S. Koener, *Clinical features and natural history of occupational asthma due to western red cedar (Thuja plicata).* The American journal of medicine, 1982. 72(3): p. 411-415.*for*

[4] Kauppinen, T., et al., *Occupational exposure to inhalable wood dust in the member states of the European Union.* Annals of Occupational Hygiene, 2006. 50(6): p. 549-561.

[5] Meo, S.A., *Lung function in Pakistani wood workers.* International journal of environmental health research, 2006. 16(03): p. 193-203.

[6] Magnavita, N., et al., *Aesthesioneuroblastoma in a woodworker.* Occupational Medicine, 2003. 53(3): p. 231-234.

[7] Milanowski, J., et al., *Work-related symptoms among furniture factory workers in Lublin region (eastern Poland).* Annals of Agricultural and Environmental Medicine, 2002. 9(1): p. 99-103.

[8] Pontier, J., et al., *Asthma from tropical abachi wood.* Revue de pneumologie clinique, 2002. 58(5 Pt 1): p. 282-285.

[9] Roux, F., et al. *Adenocarcinomas of the ethmoid sinuses. Epidemiological data*. in *Annales d'oto-laryngologie et de chirurgie cervico faciale: bulletin de la Societe d'oto-laryngologie des hopitaux de Paris*. 2002.

[10] Boskabady, M.H., et al., *Work-related respiratory symptoms and pulmonary function tests in northeast iranian (the city of Mashhad) carpenters.* Clinics, 2010. 65(10): p. 1003-1007.

[11] Ameille, J., et al., *Reported incidence of occupational asthma in France, 1996–99: the ONAP programme.* Occupational and environmental medicine, 2003. 60(2): p. 136-141.

[12] Al Zuhair, Y., C. Whitaker, and F. Cinkotai, *Ventilatory function in workers exposed to tea and wood dust.* British journal of industrial medicine, 1981. 38(4): p. 339-345.

[13] Malo, J.-L., et al., *Prevalence of occupational asthma among workers exposed to eastern white cedar.* American journal of respiratory and critical care medicine, 1994. 150(6): p. 1697-1701.

[14] Thetkathuek, A., et al., *Rubberwood dust and lung function among Thai furniture factory workers.* International journal of occupational and environmental health, 2010. 16(1): p. 69-74.

[15] Kumar, V., et al., *Lung Function Assessment among Wood Workers at Mangalore, India.* New Clinician, 2014. 1.