DOI: https://doi.org/10.54393/pbmj.v5i6.534

PAKISTAN BIOMEDICAL JOURNAL

https://www.pakistanbmj.com/journal/index.php/pbmj/index

Volume 5, Issue 6 (June 2022)

Original Article

Occupational Impact on The Respiratory Health & Function of Women, Working in The Glass Bangle Industry

Arshad Sattar Lakho[1], Akbar Gohar Abro[2], Abdul Hafeez Thebo[2], Khalil Kazi[3], Saba Bashir[4], Ghulam Shahar Bano[5]

[1]Department of Medicine, Liaquat University of Medical & Health Sciences, Jamshoro, Pakistan
[2]Department of Pulmonlogy, Liaquat University of Medical & Health Sciences, Jamshoro, Pakistan
[3]Department of Community Medicine, Indus Medical College, Pakistan
[4]Indus Medical College, Pakistan
[5]Liaquat University of Medical & Health Sciences, Jamshoro, Pakistan

ARTICLE INFO

Key Words:

Occupational Health, Occupational Disease, Women's Health, Respiratory Function and Respiratory Impairment

How to Cite:

Sattar Lakho , A. ., Gohar Abro , A. ., Hafeez Thebo, A. ., Kazi , K. ., Bashir, S. ., & Shahar Bano, G. . (2022). Occupational Impact on The Respiratory Health & Function of Women, Working in The Glass Bangle Industry: Occupational Impact on the Respiratory Health & Function of Women, Working in The Glass Bangle Industry. Pakistan BioMedical Journal, 5(6). https://doi.org/10.54393/pbmj.v5i6.534

***Corresponding Author:**

Arshad Sattar Lakho
Dept. of Medicine, Liaquat University of Medical & Health Sciences, Jamshoro
docarshadlakho@hotmail.com

Received Date: 8th June, 2022
Acceptance Date: 25th June, 2022
Published Date: 30th June, 2022

ABSTRACT

The International Labor Organization (ILO), "reiterate every year the concern of ever-increasing burden of occupational illnesses, especially among less empowered population in less developed countries such as Pakistan. One such industry is the bangle industry wherein women work in poor conditions and are exposed to various heavy metals, such as arsenic, lead, zinc, copper, manganese, cobalt, cadmium, and selenium (used as coloring agents), putting their health at risk. **Objective:** To determine the respiratory health and function of women, working in the bangle industry. **Methods:** This observational, cross-sectional study included a sample of 100 women, (selected using snowball sampling) working in the bangle industry in Southern Pakistan. The women were approached, and their respiratory function and oxygen saturation gauged using appropriate apparatus. The data was analyzed using SPSS. V. 21.0. **Results:** The mean values of various spirometric variables (FVC, FEV_1, IMBC, and PEFR) were within normal range. However, FEV_1/FVC% was reduced significantly ($p < 0.001$) among the study participants. Additionally, a high prevalence (26%) of respiratory impairment was noted. The respiratory impairment observed indicated primarily restrictive pattern of pulmonary abnormality (18%). The effect of the duration of exposure on the prevalence of respiratory impairment in the glass bangle industry was significant" ($p < 0.05$). **Conclusion:** Women employed in the glass bangle industry have poor respiratory health and continue to suffer from increasingly high levels of respiratory impairment.

INTRODUCTION

There has been rapid industrialization in south-east Asia during the last four decades and it is likely to accelerate further in the coming years. [1] Industrialization and "urbanization are creating new problems and new challenges in the field of industrial health. [2] Increased respiratory morbidity in industrial workers and inhabitants of industrial towns has been well recognised and many surveys conducted from to time have clearly established it. [3] Amongst the respiratory diseases, chronic bronchitis has been a matter of concern in Britain for a long time and was even called 'Englishman's disease'. [4] It is now well known that chronic bronchitis is prevalent in almost all countries particularly in industrialized ones. [5] The prevalence of chronic bronchitis varies not only from country to country but also from one set of people to another living in different geographical areas. [6, 7] It also varies in people of different ethnic origins and engaged in different occupations in a single country. [8] Chronic

DOI: https://doi.org/10.54393/pbmj.v5i6.534

bronchitis surveys have been carried in the neighboring country (India) in two types of population groups, firstly in general populations and secondly in different occupational groups as a part of health surveys. Surveys reported a prevalence of 1% to 12.5% of chronic bronchitis in different population groups. The study conducted by Industrial Toxicology Research Centre, Lucknow, India in the glass bangle Industry of Firozabad has revealed the prevalence of chronic bronchitis in 23.9% of glass bangle workers. [9, 10] Glass bangle workers are exposed to a wide variety of toxicants at their work places. The studies conducted revealed a very high prevalence of chronic bronchitis (22.6 and 23.9% respectively) and pulmonary tuberculosis (15.2%) in the glass bangle industry. [11 - 13] The reported risk factors associated with chronic bronchitis in different occupational groups in the glass bangle industry. [14] However, there is scant information on the types of pulmonary function impairment in glass bangle workers suffering from chronic bronchitis except that of few investigators which dealt with the respiratory status of healthy and pneumoconiotic bangle workers". [15] The present study was undertaken to evaluate the prevalence of different types of respiratory abnormalities in chronic bronchitis and the occupational factors responsible for the physiological dysfunction among the glass bangle workers.

METHODS

This observational, cross-sectional study included a sample of 100 women, (selected using snowball sampling) working in the bangle industry in Southern Pakistan. The women were approached, and their respiratory function and oxygen saturation gauged using appropriate apparatus. The data was analyzed using SPSS. V. 21.0.

RESULTS

The mean values of various spirometry variables (FVC, FEV1, IMBC, and PEFR) were within normal range. However, FEV1/FVC% was reduced significantly ($p < 0.001$) among the study participants. Additionally, a high prevalence (26%) of respiratory impairment was noted. The respiratory impairment observed indicated primarily restrictive pattern of pulmonary abnormality (18%). The effect of the "duration of exposure on the prevalence of respiratory impairment in the glass bangle industry was significant ($p < 0.05$).

Characteristics	Group	Percentages
Age Group	15 -29	37%
	30 - 45	52%
	46 - 60	11 %
Education	Not Formally Educated	34%
	Primary	47%
	Secondary	12%
	Higher	07%
Marital Status	Married	64%
	Single	23%
	Widowed / Divorced	13%
Smoking Status	Never	73%
	Current Smoker	21%
	Former Smoker	06%
Respiratory System Status	Normal	74%
	Impaired	26%

Table 1: Sample Description

Characteristics	Group	Mean + SD	P - Value
Spirometric Values	FVC	87.4% + 5.7%	> 0.05
	IMBC	175 + 13.2 l/min	> 0.05
	PEFR	354.5 + 6.54l/min	> 0.05
	FEV^1/FVC	53.4% + 3.2%	< 0.001*
Duration of Exposure	Less than 6 Months	05%	> 0.05
	More than 6 Months	21%	< 0.05**

Table 2: Respiratory Functions

DISCUSSION

The tests of ventilation conducted on glass bangle workers suffering from chronic bronchitis showed an obstructive type of ventilatory dysfunction. The high prevalence (23.9%) of chronic bronchitis associated with obstruction could be attributed to a variety of pulmonary toxicants prevailing in the work environment of glass bangle industry. Other factors, like smoking habits, also play a role. Different studies reported that smoking is the most important risk factor for chronic respiratory diseases and accompanying air flow obstruction. They further observed that cigarette smoke affects both the airways and the lung paren- chyma. [16, 17] In addition to smoking, there are also a number of putative risk factors for the development of chronic obstructive pulmonary diseases which include occupational and environmental factors, such as exposure to dust and gases, air pollution, and environmental tobacco smoke. Industrial hygiene studies conducted to assess the pollution levels in the glass bangle industry indicated high levels of suspended par- ticulate matter in the work environment ranging from 12.65 mg/m3 to 162.63 mg/m3 of air. [18, 19] While the suspended particulates contained a number of heavy metals, the concentration of most of the metals like cadmium, copper, manganese, nickel, chrome, arsenic, and selenium was within the normal threshold limit values (TLVs) set by the American Conference of Governmental Industrial Hygienists. Bangle workers involved in the mixing process were particularly exposed to cadmium, copper, and manganese while the concentrations of lead and zinc were appreciably higher than the prescribed maximum allowable concentration (MAC values) recommended for ambient air. The glass bangle workers, particularly those who worked near the different furnaces and those engaged in the baking

DOI: https://doi.org/10.54393/pbmj.v5i6.534

process, were exposed to high concentrations of lead. This could be due to the fact that there is a high density of coal based furnaces in the work environment of the glass bangle industry. [18 - 20] It has been reported a very high prevalence of respi- ratory morbidity in the glass bangle workers (51.7%) and the control population (38.6%), which was attributed to high concentrations of suspended particulates, sulfur dioxide, and coal dust in the ambient air emanating from the glass bangle industries. The prevalence of pulmonary tuberculosis was also found to be quite high in the glass bangle workers (15.2%) and in the general population (7.8%). The low socio-economic profile and unhygienic living and working conditions may be the etiological factors in the development of the disease in the glass bangle workers and the general population of Firozabad. [21, 22] They reported that 7.2% of the glass bangle workers suffered from radiological abnormalities suggestive of mixed pneumoconiosis caused possibly by chronic exposure to dust and fumes con- taining different metals in the work environment. High levels of air pollution in Firozabad were also reported. [23] They found high concentrations of sulfur dioxide and suspended particulates in the ambient air. [24] Studies reported a sulfur dioxide level of 0.159 _ + 0.243 mg/m3 of air inside the glass bangle industry. However, the allowable concentration of sulfur dioxide was below the MAC value published. It has been reported that a high prevalence of chronic bronchitis from different cities with high pollution levels which were attributed to high levels of air pollution to large amounts of coal burnt in various industrial units of Firozabad. Presence of zinc and lead in the air samples to industrial pollution was also reported to be in high concentrations of heavy metals such as chromium, copper, cadmium, and manganese in hair samples of the bangle workers, confirming the findings of the industrial hygiene studies. In such a situation of exposure to a wide variety of toxicants in the work environment in a number of occupations in the glass bangle industry, it is difficult to implicate any one particular agent as a causative factor responsible for chronic bronchitis" and associated ventilatory dysfunction. [25]

CONCLUSION

The high prevalence of "bronchial obstruction observed in the chronic bronchitic glass bangle workers is in all likelihood the result of chronic exposures to flue products emanating from various coal furnaces and to multimetals prevailing in the work environment. Women in particularly, employed in the glass bangle industry have poor respiratory health" and continue to suffer from increasingly high levels of respiratory impairment.

REFERENCES

[1] Hill H. Rapid Industrialisation in ASEAN: Some Analytical and Policy Lessons. Agenda: A Journal of Policy Analysis and Reform. 1997 Jan 1:419-32. doi.10.22459/AG.04.04.1997.03

[2] Kuddus MA, Tynan E, McBryde E. Urbanization: a problem for the rich and the poor? Public Health Rev. 2020 Jan 2;41:1. doi: 10.1186/s40985-019-0116-0.

[3] Tchounwou PB, Yedjou CG, Patlolla AK, Sutton DJ. Heavy metal toxicity and the environment. Exp Suppl. 2012;101:133-64. doi: 10.1007/978-3-7643-8340-4_6

[4] Burney P. Chronic respiratory disease - the acceptable epidemic? Clin Med (Lond). 2017 Feb;17(1):29-32. doi: 10.7861/clinmedicine.17-1-29.

[5] Dotan Y, So JY, Kim V. Chronic Bronchitis: Where Are We Now? Chronic Obstr Pulm Dis. 2019 Apr 9;6(2):178-192. doi: 10.15326/jcopdf.6.2.2018.0151.

[6] Jarhyan P, Hutchinson A, Khaw D, Prabhakaran D, Mohan S. Prevalence of chronic obstructive pulmonary disease and chronic bronchitis in eight countries: a systematic review and meta-analysis. Bull World Health Organ. 2022 Mar 1;100(3):216-230. doi: 10.2471/BLT.21.286870.

[7] Alam DS, Chowdhury MA, Siddiquee AT, Ahmed S, Clemens JD. Prevalence and determinants of chronic obstructive pulmonary disease (COPD) in Bangladesh. COPD: Journal of Chronic Obstructive Pulmonary Disease. 2015 Nov 2;12(6):658-67.

[8] Munn Z, Moola S, Riitano D, Lisy K. The development of a critical appraisal tool for use in systematic reviews addressing questions of prevalence. Int J Health Policy Manag. 2014 Aug 13;3(3):123-8. doi: 10.15171/ijhpm.2014.71.

[9] Ciapponi A, Alison L, Agustina M, Demián G, Silvana C, Edgardo S. The epidemiology and burden of COPD in Latin America and the Caribbean: systematic review and meta-analysis. COPD. 2014 Jun;11(3):339-50. doi: 10.3109/15412555.2013.836479.

[10] Finney LJ, Feary JR, Leonardi-Bee J, Gordon SB, Mortimer K. Chronic obstructive pulmonary disease in sub-Saharan Africa: a systematic review. Int J Tuberc Lung Dis. 2013 May;17(5):583-9. doi: 10.5588/ijtld.12.0619.

[11] McKay AJ, Mahesh PA, Fordham JZ, Majeed A. Prevalence of COPD in India: a systematic review. Prim Care Respir J. 2012 Sep;21(3):313-21. doi: 10.4104/pcrj.2012.00055.

[12] Chapman KR, Mannino DM, Soriano JB, Vermeire PA, Buist AS, Thun MJ, Connell C, Jemal A, Lee TA, Miravitlles M, Aldington S, Beasley R. Epidemiology and costs of chronic obstructive pulmonary disease. Eur Respir J. 2006 Jan;27(1):188-207. doi:

DOI: https://doi.org/10.54393/pbmj.v5i6.534

10.1183/09031936.06.00024505
[13] Moher D, Liberati A, Tetzlaff J, Altman DG; PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. BMJ. 2009 Jul 21;339:b2535. doi: 10.1136/bmj.b2535.
[14] Dutta S, Deshmukh PR. Prevalence and determinants of self-reported chronic bronchitis among women in rural Central India. Med J Armed Forces India. 2015 Jan;71(1):48-52. doi: 10.1016/j.mjafi.2014.10.002.
[15] Jindal SK, Aggarwal AN, Gupta D, Agarwal R, Kumar R, Kaur T, Chaudhry K, Shah B. Indian study on epidemiology of asthma, respiratory symptoms and chronic bronchitis in adults (INSEARCH). Int J Tuberc LungDis.2012Sep;16(9):12707.doi:10.5588/ijtld.12.0005
[16] Mahesh PA, Jayaraj BS, Prabhakar AK, Chaya SK, Vijaysimha R. Identification of a threshold for biomass exposure index for chronic bronchitis in rural women of Mysore district, Karnataka, India. Indian J Med Res. 2013 Jan;137(1):87-94.
[17] Mahesh PA, Jayaraj BS, Chaya SK, Lokesh KS, McKay AJ, Prabhakar AK, Pape UJ. Variation in the prevalence of chronic bronchitis among smokers: a cross-sectional study. Int J Tuberc Lung Dis. 2014 Jul;18(7):862-9. doi: 10.5588/ijtld.13.0048
[18] Biswas RS, Paul S, Rahaman MR, Sayeed MA, Hoque MG, Hossain MA, Hassan MM, Faiz MA. Indoor biomass fuel smoke exposure as a risk factor for chronic obstructive pulmonary disease (COPD) for women of rural Bangladesh. Chattagram Maa-O-Shishu Hospital Medical College Journal. 2016 Jul 17;15(1):8-11. doi.10.3329/cmoshmcj.v15i1.28753
[19] Mukhmohit S, Bhardwaj A, Saini S, Mukherjee AK, Kannan R. COPD—prevalence and risk study among females of rural area, district Ambala, Haryana, India. Journal of Evolution of Medical and Dental Sciences. 2014Apr21;3(16):418392.doi.10.14260/jemds/2014/2416
[20] Sinha B; Vibha, Singla R, Chowdhury R. An epidemiological profile of chronic obstructive pulmonary disease: A community-based study in Delhi. J Postgrad Med. 2017 Jan-Mar;63(1):29-35. doi: 10.4103/0022-3859.194200
[21] Mahesh PA, Lokesh KS, Madhivanan P, Chaya SK, Jayaraj BS, Ganguly K, Krishna M. The Mysuru stUdies of Determinants of Health in Rural Adults (MUDHRA), India. Epidemiol Health. 2018 Jun 23;40:e2018027. doi: 10.4178/epih.e2018027.
[22] Arora S, Rasania SK, Bachani D, Gandhi A, Chhabra SK. Air pollution and environmental risk factors for altered lung function among adult women of an urban slum area of Delhi: A prevalence study. Lung India. 2018 May-Jun;35(3):193-198. doi: 10.4103/lungindia.lungindia_263_17
[23] Chaturvedi R, Muzammil K, Singh N, Davey S, Singh JV. Prevalence of COPD in rural population, Muzaffarnagar. Indian Journal of Community Health. 2015 Dec 31;27(4):467-71.
[24] Mukherjee S, Roychoudhury S, Siddique S, Banerjee M, Bhattacharya P, Lahiri T, Ray MR. Respiratory symptoms, lung function decrement and chronic obstructive pulmonary disease in pre-menopausal Indian women exposed to biomass smoke. Inhal Toxicol. 2014 Dec;26(14):866-72. doi: 10.3109/08958378.2014.965560.
[25] Panigrahi A, Padhi BK. Chronic bronchitis and airflow obstruction is associated with household cooking fuel use among never-smoking women: a community-based cross-sectional study in Odisha, India. BMC Public Health. 2018 Jul 27;18(1):924. doi: 10.1186/s12889-018-5846-2.