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# Association of Personal Protective Equipments with Respiratory Morbidity among Puffed Rice Workers of Davanagere City

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## Abstract

**Introduction :** Personal Protective Equipments (PPE) are designed to protect employees from various workplace injuries or illnesses which resulting from contact with chemical, radiological, physical, electrical, mechanical or other workplace hazards. The protection of workers from workplace hazards is crucial to reduce mortality and morbidity. These morbidities and mortalities will occur long after the workman has left the work.

**Methods:** A Cross sectional study was conducted among puffed rice workers in Bashanagar, urban field practice area of SSIMS & RC, Davanagere from January to December 2017. The study population included 550 puffed rice unit workers. Data was entered in the Microsoft excel and analysed using SPSS v20.

**Results:** In this study majority of the workers (93.4%) were non users of any personal protective equipments. In this study Respiratory morbidity was higher among non-users of personal protective equipment but no statistical significant association was found between personal protective equipment and respiratory morbidity.

**Conclusions:** In present study no significant association was found between respiratory morbidity and personal protective equipments.

***Keywords:*** *Personal protective equipments , Respiratory morbidity, Davanagere*

## Introduction

Personal Protective Equipment (PPE) are designed to protect employees from various workplace injuries or illnesses which resulting from contact with chemical, radiological, physical, electrical, mechanical or other workplace hazards, The equipments are face shields, safety glasses/goggles, hats/safety helmets, safety shoes, coveralls, gloves, ear protection (ear plugs and muffs), vests, respirators, etc.[1] Sir Thomas Morrison Legge was identified the roles of the employer and those of the employee in reducing workplace hazards and consequently achieving a healthy workplace environment. The protection of workers from workplace hazards is crucial to reduce mortality and morbidity. These morbidities and mortalities will occur long after the workman has left the work.[2] Puffed rice is

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a popular food item, Karnataka has some of the largest number of clusters of Puffed Rice units. Davangere is the largest supplier of puffed rice not only to other districts of Karnataka but also to other states. The fuels used in ovens are mainly rice husk, wood shavings, groundnut shell and automobile tires as they generate high heat and are of low cost. Subjects with workplace exposure to organic dust have high risk of prevalence of respiratory diseases.[3] This study was taken up in order to assess the compliance of personal protective equipments and to determine its association with respiratory morbidity among the puffed rice units workers of Davanagere city.

## Materials and Methods

A cross sectional study was conducted during January to December 2017 among the workers of puffed rice units situated at Bashanagar, Urban field practice area of SSIMS&RC, Davanagere. Ethical clearance was obtained from the Institutional Ethical Review Board. The workers working in these units aged above 14 years, Workers working for greater than 1 year and Workers willing to participate were included in the study. Pregnant women, those who have undergone cardiothoracic surgery and recent history of Myocardial infarction were excluded from the study.A study by Energy Research Institute among the puffed rice production workers in Davangere showed that the respiratory morbidity was 15.6%.

Where p= prevalence of respiratory morbidity 15.6, q= 100-p= 84.4, d= 20% of p = 3.12

Hence n= 4 x15.6x84.4 = 541

3.12x3.12

N= 541, rounded for 550.

In order to collect data from 550 workers, out of 1200 puffed rice production units situated in Bashanagar, 550 production units were selected by using simple random sampling method using random number table. From each unit only one worker was taken randomly by lottery method. A pretested semi structured and validated questionnaire were used to collect information from each worker after taking informed consent. Respiratory morbidity assessment, occupational and exposure history were taken from American Thoracic society (ATS)[4] .The questions related to Occupational Safety and Personal Protective Equipment were taken from National Institute for Occupational Safety and Health (NIOSH) questionarrie[5]. Spirometry was carried out by the instrument RMS (Helios's) Spirometer. The following parameters were used in the spirometry

**1.Forced Expiratory Volume in the 1st Second (FEV1):**It is the volume of air in liters that can be forcefully and maximally exhaled in the 1st second after a maximal inspiration.

**2. Forced Vital Capacity (FVC):** It is the volume of air in liters that can be forcefully and maximally exhaled after a maximal inspiration. **3**.**FEV1/FVC Ratio.**. It is the amount of air exhaled in the first second divided by all of the air exhaled during a maximal exhalation. Any person with spirometer reading showing FEV1 <80% of the predicted normal for age and sex , FVC usually reduced but to a lesser extent than FEV1 and FEV1/FVC ratio reduced to <0.7 were considered to have Obstructive pulmonary disease and spirometer showing FEV1 <80% of the predicted normal, FVC <80% of the predicted normal and FEV1/FVC ratio being normal (i.e. >0.7) were diagnosed to have Restrictive pulmonary disease. The results of spirometry were assessed according to the criteria followed by American Thoracic Society[5].

Data was entered in MS EXCEL and statistical analysis was done using SPSS version 20 and results were expressed in terms of percentages and proportions. Analysis was carried out by chi square test to find out the association between respiratory morbidity compliance of personal protective equipments.

## Results

The prevalence of respiratory morbidity among the puffed rice workers in the present study was found to be 41.0%. Among them 51(9.2%) puffed rice workers reported Obstructive lung diseases and majority of the workers 175(31.8%) reported Restrictive pattern of lung diseases. The patterns of the respiratory morbidity are explained in the Table 1.

In this study, duration of the work of the majority of the workers was 11-20 years i.e. (39.5%), majority of them were involved in salt mixing process (25.3%) and majority of the workers work less than 9 hours per day(81.9 %). The distribution of study participants based

on occupational and exposure history are explained in the table 2.

In this study majority of the workers (93.4%) were non users of any personal protective equipment. Among the users majority of them were using Goggles (3.7%). The compliance of personal protective equipments among study participants are explained in Table 3.

In this study Respiratory morbidity was higher among non-users of personal protective equipment but no statistical significant association was found between personal protective equipment and respiratory morbidity. The association between respiratory morbidity with personal protective equipments are explained in the table 4.

In this study the study participants reported various reasons for non compliance of personal protective equipments. Majority of the participants (60.6%) were reported that they were uncomfortable to personal protective equipments. Other reasons includes it's unnecessary (33.2%) and non availability of personal protective equipments (6.2%) . The reasons are explained in the table 5.

**Table 1: Distribution of study participants based on pattern of respiratory morbidity.**

| Variables | Frequency | Percentages |
|---|---|---|
| Normal lung function | 324 | 59.0 |
| Obstructive | 51 | 9.2 |
| Restrictive | 175 | 31.8 |
| Total | 550 | 100 |
| Grading of obstruction based on FEV1 ratio | | |
| Mild obstruction (FEV 1 > 70 % pred.) | 8 | 16.0 |
| Moderate(60–69%) | 19 | 38.0 |
| Moderately severe(50–59%) | 13 | 26.0 |
| Severe(35–49%) | 11 | 22.0 |
| Grading of restrictive disease based on FVC ratio | | |
| Mild restriction (FVC>70% pred.) | 26 | 15.0 |
| Moderate restriction (60-69%) | 77 | 44.0 |
| Moderately severe (50-59%) | 45 | 26.0 |
| Severe (30-49%) | 23 | 13.0 |
| Very severe (<35%) | 4 | 2.0 |

**Table 2.Distribution of study participants based on Occupational and exposure history.**

| Variables | Frequency(n) | Percentage (%) |
|---|---|---|
| **Duration of work in years** | | |
| 1-5 years | 77 | 14.0 |
| 6-10 years | 107 | 19.5 |
| 11-20 years | 217 | 39.5 |
| > 20years | 149 | 27.0 |
| **Type of work** | | |
| Puffing | 88 | 16.0 |
| Salt mixing | 139 | 25.3 |
| Water filling | 66 | 12.0 |
| Soaking | 48 | 8.7 |
| Paddy boiling | 57 | 10.3 |
| Rice drying | 100 | 18.2 |
| Rice carry for dehusking | 52 | 9.5 |
| **Duration of hours/day** | | |
| Less than 9 hours per day | 450 | 81.9 |
| More than 9 hours per day | 100 | 18.1 |
| Total | 550 | 100 |

**Table 3. Distribution of study participants based on compliance of Personal protective equipment.**

| Variables | Frequency(n) | Percentage(%) |
|---|---|---|
| Non users | 514 | 93.4 |
| **Users** | | |
| Mask | 13 | 2.4 |
| Goggles | 20 | 3.7 |
| Gloves | 3 | 0.5 |
| Total | 550 | 100 |

**Table 4. Association of respiratory morbidity with personal protective equipment**

| Variables | Spirometry pattern | | | Total | X2 Value | Df | P value |
|---|---|---|---|---|---|---|---|
| Personal protective equipments | Normal | Obstructive | Restrictive | | | | |
| Users | 18(50.0%) | 3(8.3%) | 15(42.0%) | 36(100.0%) | 1.73 | 2 | 0.421 |
| Non users | 306(60.0%) | 48(9.3%) | 160(31.1%) | 514(100.0%) | | | |
| Total | 324(59.0%) | 51(9.2%) | 175(31.8%) | 550(100.0%) | | | |

**Table 3: Reasons for non compliance for personal protective equipments**

| Reasons | | |
|---|---|---|
| | Frequency | Percentage (%) |
| 1. Non availability | 34 | 6.2 |
| 2. Uncomfortable | 334 | 60.6 |
| 3. Unnecessary | 182 | 33.2 |

## Discussion

This study was conducted among workers employed in puffed rice units which are located in Bashanagar, urban field practice area of SSIMS &RC, Davanagere. In this study duration of work of the majority of workers was 11-20 years (39.5%). Similar result was found by study conducted by Uma R et al[8]. In this study majority of the workers work less than 9 hours . In contrast to this a study done by Rana MC et al.[9] showed the workers works more than 9 hours/day. In this study majority of the workers involved in salt mixing process .In this study Majority of the workers did not use any form of personal protective equipment and respiratory morbidity was higher among non-users of personally protective equipment but no statistical significant association was found. Similar results were found from study done by Ratnaprabha GK et al.[7] In contrast to this a study done by Rana MC et al.[9] showed that significant association was found between personal protective equipment and respiratory morbidity. In this study the reasons cited for non compliance of personal protective equipments were felt Uncomfortable(60.3%), unnecessary(33.2%) and Non availability (6.2%). In present study prevalence of respiratory morbidity among puffed rice workers was 41.0%.Among them 51(9.2%) puffed rice workers reported obstructive lung diseases and majority of the workers 175(31.8%) reported restrictive pattern of lung diseases. Similar results were found by A case study done by the Energy Research Institute, Bangalore at Davanagere city[3] which Showed that majority of the workers were reported restrictive pattern of lung diseases and Tawade PM et al.[11] In contrast to this study a study done by Rana MC et al.[9], Ghosh T et al[10] showed that

majority of the workers in their study were reported obstructive pattern of respiratory diseases.

## Conclusion

In this study majority of the workers did not use any form of personal protective equipment and respiratory morbidity was higher among non-users of personally protective equipment but no statistical significant association was found.

**Recommendations**

1. To initiate provision and promotion of personal protective equipment (such as respiratory mask) to all who were involved in puffed rice units.

2. Pre-placement examination of workers be carried out before they join the puffed rice units.

3. Regular periodic medical examination is required.

4. Health education must be done about the dangers of rice dust exposure, occupational lung diseases and other occupational hazards and use of personal protective equipment for protection from hazards.

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**Declarations**

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**Conflict of Interest:** None declared

**Ethical approval:** The study was approved by the Institutional Ethics Committee

## References

**1.** Occupational Safety and Health Administration (OSHA) Fact Sheet. U.S Department of Labor. 2009; Accessed on 6/09/2013 from: URL: http://www.osha-slc/gov/SLTC/constructionppe/index.html

**2.** Aguwa EN. A Review of Sir Thomas Legge's Aphorisms and Workplace Personal Protective Equipments - Is There Gap in Knowledge, Attitude and Utilization? Occup Med Health Aff. 2013; 1: 138. doi: 10.4172/2329-6879.1000138.

**3.** The Energy and research institute, India. Assessing and mitigating health risks form puffed rice cluster: A case study of Davangere, Karnataka. Centre file: 102463-005. [Online]. Feb 2006 [Accessed 3rd Oct 2016]; Available from:URL: https://idl-bnc.idrc.ca.dspace.bitstream

**4.** Benjamin G, Ferris. ATS-DLD-78 recommended adult questionnaire. Am Rev Respir Dis 1978; 118:1-120. Available from: URL: http://www.cdc.gov/niosh/atswww.txt on 19-02-12

**5.** National Institute of Occupational Safety and Health. Survey of personal protective equipment used in foundries. [Online]. [Cited 2016 Dec 10]. Availible from: URL: https://www.cdc.gov/niosh/docs/80-100/pdfs/80-100.pdf

**6.** Pellegrino R , Viegi G , Enright P et al. Interpretative strategies for lung function tests. Eur Respir J 2005;26:948-68

**7.** Ratnaprabha GK, Manjunath. Respiratory Morbidities and Pulmonary Function Tests of Rice Mill Workers in a City of Karnataka. J Pub Health Med Res 2016;4(1):0-1

**8.** Uma R, Rajeshwari L. Susceptibility towards obstructive lung change (FEV1/FVC) in rice mill workers in comparison to normal adult individuals. Int J Biol Med Res 2016;7(2):5534-6.

**9.** Rana MC, Naskar S, Roy R, Das DK, Das S. Respiratory morbidity among rice mill workers in an urban area of Burdwan District, West Bengal: A cross-sectional study. Indian J Occup Environ Med 2018; 22:5-10.

**10.** Ghosh T, Gangopadhyay S, Das B. Prevalence of respiratory symptoms and disorders among rice mill workers in India. Environ Health Prev Med 2014; 19:226-33.

**11.** Tawde PM, Kazi AH , Gunjal SB, Jaiswal AV, Mahaja AA, Khatri SM. Effects of Breathing Exercise and Preventive Measure on Pulmonary Functions in Flour Mill Workers. Int J Health Sci Res. 2015; 5(7):241-9.