

Health Issues of Shipbreakers of Bangladesh

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Abstract

Background: Shipbreaking workers are vulnerable to long term health issues resulting from the poor environmental conditions existing in the shipbreaking yards of Bangladesh. The objective of this study was to identify the different respiratory health issues among longtime shipbreakers.

Materials and methods: This study involved observations and health testing of 25 workers engaged as shipbreakers for a minimum of 15 years. Informed written consent was obtained from each subject and health information was noted in a predesigned data sheet. Data was compiled and analyzed using SPSS 20.

Results: The mean age of the shipbreakers were 49.28 years and the mean duration of work was 26.08 years. The subjects experienced comorbidities such as hypertension and peptic ulcer disease. Symptoms included cough, dyspnea on exertion, chest pain, weakness, and body swelling. Lab data revealed variable results of hemoglobin, Total Count (TC) Random Blood Sugar (RBS) serum creatinine, Alanine Transaminase (ALT) and Aspartate Transaminase (AST). X-ray findings and spirometry data showed mild to severe lung restriction with only 28% of the workers having normal spirometry results. Lung volumes revealed forced vital capacity (FVC), forced expiratory volume in one second (FEV1) and FEV1/FVC were 2.40 ± 0.69 , 1.82 ± 0.58 and 77.56 ± 16.27 , respectively. High Resolution Chest Tomography (HRCT) showed apical fibrosis, bronchiectasis, Chronic Obstructive Pulmonary Disease (COPD) ground glass opacities, hyperinflated lungs with bullae and pleural thickening, mediastinal lymphadenopathy, old Tuberculosis (TB) changes, and pulmonary calcifications. Thirty-two percent of the HRCTs were normal.

Conclusions: Shipbreaking workers participating in the study experienced significant occupational lung-related issues along with various comorbidities.

Key words: Lung; Restriction; Shipbreakers; Spirometry.

Introduction

Shipbreaking, also referred to as ship dismantling, ship scrapping, and ship recycling, is a unique part of the maritime industry, primarily involving the dismantling and disposal of obsolete Navy and Maritime Administration ships as well as commercial barges and mobile offshore drilling units.¹ The vessel dismantling is usually conducted at a pier, dry dock or dismantling slip in developed countries and on beaches in developing areas such as Bangladesh. The activities involved in shipbreaking include removing all gear and equipment then cutting down and recycling the ship's structure. Ship breaking countries provide a valuable service to the global economy as recycled ships that are no longer operable might otherwise be abandoned or sunk.²

The structural complexity of ships makes shipbreaking a challenging process. It involves many safety, health, and environmental issues, including exposure to asbestos, toxic fumes, hazardous materials, noise, falling objects, and lead, as well as dangers associated with electrical shock, heat stress, falls, handling heavy materials, and fires.³

As shipbreaking by domestic and overseas companies is rapidly growing, there is a need to improve shipbreaking processes and the safety measures provided to the shipbreaking workers to ensure their safety and health.⁴

In Bangladesh, shipbreaking workers are poorly paid and are without any significant health protection or health insurance coverage.⁴ Those who are working for long durations are very vulnerable to different health issues, most notably chronic lung diseases, skin diseases, mesothelioma and hypertension.⁵ As such, this study's intent was to determine, both visually and through testing, the health hazards prevalent in those long-term workers.

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Materials and methods

This observational study, involving 25 shipbreaking workers, was undertaken during a six month period from June 2021 to December 2021. All of the participants were involved in shipbreaking for a minimum of 15 years. Workers who either worked less than 15 years in the industry or who were unwilling to be included in the study were excluded. The Bangladesh Environmental Lawyers Association (BELA), a Non-Governmental Organization (NGO) looks after the different legal and health issues of the shipbreaking workers of Bangladesh. There was an agreement with BELA and this researcher to check the health issues of those shipbreakers who qualified to participate in the study. BELA referred all 25 shipbreaking workers from their work places to the consultation chamber of the researcher for interviews and participation. At least three to four shipbreakers visited this researcher's health clinic daily, where they provided necessary health information including age, duration in the shipbreaking industry, smoking history, comorbidities, etc., and then undertook the physical examination. Five milliliters of venous blood was collected from each worker to check hematological and biochemical conditions. Electrocardiogram, (ECG), chest X-ray, spirometry and High Resolution Chest Tomography (HRCT) was performed to check heart and lung health. After receiving the laboratory results, the data was compiled and analyzed using SPSS 20 (IBM, Armonk USA). Informed written consent for publication of each worker's health data was obtained.

Results

Among 25 shipbreakers' mean age revealed 49.28 years and mean duration of work as shipbreakers was 26.08 years (Table I). Regarding smoking history 10(40%) were non smokers, 8(32%) were ex smokers and 7(28%) were current smokers. (Figure 1). Among all 7(28%) were hypertensives, 2(8%) had IHD, 1(4%) had COPD, 2(8%) had history of COPD, 10(40%) had PUD, 6(24%) had skin diseases, 2(8%) had low back pain 1(4%) had H/O major accident with deformity and 6(24%) history of minor accidents (Table II). Symptom analysis revealed 21(84%)

had cough, 8(32%) had dyspnea on exertion, 20(80%) had chest pain, 24(96%) had weakness and 1(4%) had body swelling (Table III). Mean \pm SD of hemoglobin (14.28 ± 1.17 gm/l), TC(9416 ± 1649 /cuml), RBS(94.86 ± 25.96 mg/dl), Serum creatinine (1.13 ± 0.15 mg/dl), ALT(32.42 ± 11.57 IU/L) and AST(26.55 ± 13.56 IU/L) (Table IV). CXR findings showed apical atrophy was found in 1(4%) case, cardiomegaly in 2(8%), mediastinal mass in 1(4%) pneumonitis 1(4%) cases and in 20(80%) cases there were no X-ray findings (Table V). Mild restriction was found in 5(20%) moderate restriction was found in 8(32%) severe restriction was found in 2(8%), very severe restriction was found in 1(4%), obstructive features were found in 2(8%) cases and 7(28%) cases were found normal spirometry results (Table VI). Regarding different lung volumes in spirometry Mean \pm SD of FVC, FEV1 and FEV1/FVC was 2.40 ± 0.69 , 1.82 ± 0.58 and 77.56 ± 16.27 respectively (Table VII). HRCT findings showed apical fibrosis was found in 2(8%), bronchiectasis in 1(4%), COPD changes in 2(8%), ground glass opacities in 2(8%), hyperinflated lung with bullae in 2(8%), hyperinflated lungs with pleural thickening in 2(8%) mediastinal lymphadenopathy 2(8%) old TB changes in 3(12%) pulmonary calcifications in 1(4%), and 9(32%) cases found normal (Table VIII).

Table I Age and duration of working as shipbreakers

	n	Minimum	Maximum	Mean \pm SD
Age (Years)	25	28	75	49.28 \pm 11.115
Duration of work as ship breakers (Years)	25	15	38	26.08 \pm 7.772

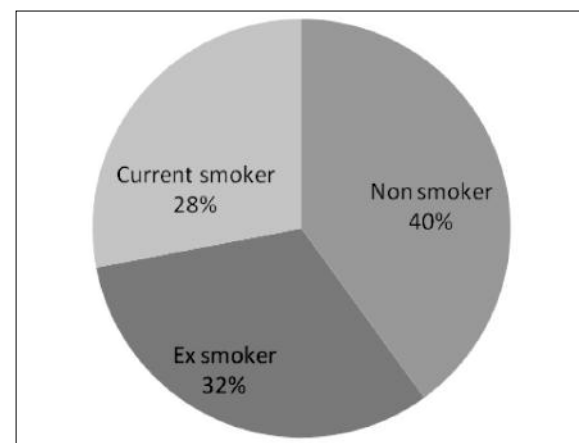


Figure 1 Smoking history

Table II Co morbidities

Co morbidities	Number	Percent
HTN	7	28
IHD	2	8
COPD	1	4
H/O PTB	2	8
PUD	10	40
Skin diseases	6	24
Insomnia	2	8
Low back pain	2	8
H/O major accident	1	4
H/O minor accident	6	24

HTN- Hypertension, IHD=Ischemic Heart Disease, COPD-Chronic Obstructive Pulmonary Disease, H/O PTB- History of Pulmonary Tuberculosis, PUD- Peptic Ulcer Diseases

Table III Symptom analysis

Smoking history	Number	Percent
Cough	21	84
Dyspnoea on exertion	8	32
Chest pain	20	80
Weakness	24	96
Body swelling	1	4

Table IV Hematological and biochemical findings

	n	Minimum	Maximum	Mean ± SD
Hb %(gm/dl)	25	12.5000	16.6000	14.28 ±1.17
TC/(cuml)	25	6400	13000	9416 ±1649
RBS(mg/dl)	25	80.5	161.0	94.86 ±25.96
Serum creatinine(mg/dl)	25	0.84	1.56	1.13 ±.15
ALT (IU/L)	19	19	60	32.42±11.57
AST (IU/L)	20	14	73	26.55 ±13.56

Hb- Haemoglobin, TC-Total Count, RBS-Random Blood Sugar, ALT-Alanine Transaminase, AST-Aspartate Transaminase.

Table V Chest X-Ray findings

CXR findings	Frequency	Percent
Apical opacity	1	4.0
Cardiomegally	2	8.0
Mediastinal mass	1	4.0
Pneumonitis	1	4.0
NAD	20	80.0
Total	25	100.0

NAD- Nothing Abnormality Detected.

Table VI Spirometry findings

	Frequency	Percent
Mild restriction	5	20.0
Moderate restriction	8	32.0
Severe restriction	2	8.0
Very severe restrictions	1	4.0
Obstructive	2	8.0
Normal findings	7	28.0
Total	25	100.0

Table VII Lung volume parameters in spirometry

Lung volumes	n	Minimum	Maximum	Mean ±SD
FVC	25	1.11	4.03	2.40±.69
FEV1	25	1.00	2.94	1.82±.58
FEV1/FVC	25	37.70	100.00	77.56±16.27

Table VIII High Resolution Chest Tomography (HRCT) findings

	Frequency	Percent
Apical fibrosis	2	8.0
Bronchiectasis	1	4.0
COPD changes	2	8.0
Ground glass opacities	2	8.0
Hyperinflated lung with bullae	2	8.0
Hyperinflated lung with pleural thickening	2	8.0
Mediastinal lymphadenopathy	2	8.0
Old TB	3	12.0
Pulmonary calcification	1	4.0
Normal findings	8	32.0
Total	25	100.0

Discussion

In March 2008, in response to a writ filed by BELA, the Bangladeshi High Court ordered eight directives, including the closure of any ship breaking yards that did not have environmental clearance and banning the beaching of any ships that had not been cleared of hazardous materials. The court also directed the Department of Environment to frame rules on shipbreaking according to the Basel Convention (1989) the Environment Conservation Act (1995) and the Environment Conservation Rules (1997). The order to close the yards was stayed after an appeal from the shipbreaking yard owners association, whose members are comprised mostly of owners operating in Bangladesh.³ Since that time, the occupational health and safety issues related to the shipbreaking workers has not significantly changed.

In this study, the mean age of shipbreakers were 49.28 years and the mean duration of labor as a shipbreaker was 26.08 years. All shipbreakers participating in the study worked in the occupation for a minimum of 15 years. As such, the workers were all exposed to work-related toxic materials for a long period of time. Age related findings are not in accordance with the study of Aigbokhaode et al where they found 59% of workers were between 20 and 29 years old.⁶ According to Mamun et al 40.75% of shipbreakers were between 18 and 22 years old, 10.17% were child laborers and 48% were over 45 years old.⁷ And according to Hossain et al about 66% of shipbreaking workers were between 20 and 39 years old and the number of workers in older age groups decreased as age increased.⁷ As this study's intent was to use subjects working 15 years or more, the age distribution does not match the data in the previous studies. Also, as people start in shipbreaking while they are young and are exposed to toxins for a long duration, many shipbreaking workers are forced to leave the occupation in middle age. These factors may explain why older workers were missing or fewer in number in those studies.

Comorbidities affecting the workers revealed that seven (28%) were hypertensive, two (8%) had IHD, 01 (4%) had COPD, 02 (8%) had history of COPD, 10 (40%) had PUD, 06 (24%) had skin diseases, 02 (8%) had low back pain, 01 (4%) had a history of a major accident with deformity and 06 (24%) had a history of minor accidents. In addition, 07 (28%) were current smokers, which exacerbated the peril to their lung health. In addition, skin, abdominal, urinary and muscle problems as well as nutritional deficiencies were identified, which were mainly caused by toxic metal, oil and chemical contaminations as well as excessive work load, long working hours, monotonous work, irregular eating, insufficient diet, unsafe drinking water, and inadequate sanitation. In a study it was found that, most of the workers were suffering from multiple diseases and poor health conditions.⁷

In this current study, the symptom analysis revealed cough, dyspnea on exertion, chest pain, weakness, and body swelling as predominant symptoms. Lab data revealed normal study of

mean \pm SD of hemoglobin, TC, RBS, serum creatinine, ALT and AST. Chest X-ray findings showed apical fibrosis in 01 (4%) case, cardiomegaly in 02 (8%) cases, mediastinal mass in 01 (4%) case and pneumonitis in 01 (4%) case. There were no significant X-ray findings in 20 (80%) cases. Cough and weakness were found to be dominant symptoms among the workers while other lab data was normal. Most of the workers were suffering from different health-related issues, likely the result of exposure to the unhealthy work environment for long durations.

A respiratory system evaluation was done by spirometry and HRCT for each shipbreaking worker. Spirometry data revealed mild restriction in 05 (20%) cases, moderate restriction in 08 (32%) cases, severe restriction in 02 (8%) cases, very severe restriction in 04 (4%) case, and obstructive features in 02 (8%) cases. Different lung volumes revealed mean \pm SD of Forced Vital Capacity (FVC) Forced Expiratory Volume in One second (FEV1) and FEV1/FVC (A ratio reflecting the amount of air that can be forcefully exhaled from the lungs) was 2.40 \pm .69, 1.82 \pm .58 and 77.56 \pm 16.27, respectively. HRCT findings showed apical fibrosis in 02 (8%) cases, bronchiectasis in 01 (4%) case, COPD changes in 02 (8%) cases, ground glass opacities in 02 (8%) cases, hyperinflated lungs with bullae in 02 (8%) cases, hyperinflated lungs with pleural thickening in 02 (8%) cases, mediastinal lymphadenopathy in 02 (8%) cases, old TB changes in 03 (12%) cases, and pulmonary calcifications in 01 (4%) case. A study done by Ahmed et al in Chittagong Bangladesh also found some common health issues among the shipbreakers such as skin diseases, eye problems, weak lung function, and musculoskeletal problems.⁸ Based on the above testing, lung health has been predominantly compromised among shipbreaking workers. Restrictive lung disease was a common consequence among the workers.

A 2008 paper of workers in Chittagong shipbreaking yards reports high prevalence of self-reported respiratory problems (80.56%) but does not state whether American Thoracic Society (ATS) questions were used.⁵ A 2003 dissertation on the general health of Bangladeshi shipbreakers reports a 52% prevalence of self-reported

respiratory tract illness, which is closer to the 37% prevalence for any respiratory symptom reported here. Standardized ATS questions were not used, which could account for some of the differences observed.⁹

Subsequent studies on the prevalence of asbestos-related disorders in shipbreaking workers should have a larger number of subjects for increased statistical power, including studies in both northern and southern Bangladesh. Collecting data from the workers in such a study is problematic as the ship owners make it difficult and workers do not feel free to honestly discuss their health issues. Data collectors face noncooperation in the field levels.¹⁰ These are some issues that need to be overcome to find the actual health issues among shipbreaking workers.

Limitation

The limited occupational health knowledge of physicians and the lack of regional research on both asbestos-related disease and occupational disease in shipbreakers made this study challenging.

Conclusions

Regarding health issues of shipbreakers lung health is the most vulnerable found in our study.

Recommendation

If those patients could be followed up for long duration, further complications related with chronic asbestos exposure among shipbreakers of Bangladesh might be explored.

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Contribution of authors

RSRB-Conception, acquisition of data drafting & final approval.

FKC-Data analysis, interpretation of data critical revision & final approval.

SH-Acquisition of data, data analysis, critical revision & final approval.

MD-Data analysis, interpretation of data, drafting & final approval.

Disclosure

All the authors declared no conflict of interest.

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