

**A PREVALENCE STUDY ON THE OCCURRENCE OF WORK ACCIDENTS  
AMONG THE MANUAL MATERIAL HANDLING WORKERS OF THE  
CENTRAL MARKET AREA IN AGARTALA CITY, WEST TRIPURA**

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**Abstract**

One of the most important central market areas of Agartala city is the Maharajganj Bazaar (Gol Bazar) where material handling, loading, and unloading work is a continuous process. Manual material handling (MMH), being a strenuous work often leads to injuries, accidents, and even death. Fifty MMH workers of the central market area in Agartala city were selected to identify the risk factors contributing to accidents. A standardized modified Nordic questionnaire was performed. Analysis of working postures by OWAS method was done and history of accident cases was collected. It was revealed that most accidents, being struck by objects and slipping and falling, have occurred during lifting and carrying loads. Accident records suggested that few accident cases have reached the hospitals indicating a general negligence of attending the hospitals.

### 1. Introduction

An accident is an unwanted, undesirable, unanticipated sudden event that results in an undesired outcome such as property damage, bodily injury or death. Every year, throughout the world, millions of occupational accidents occur (3). The scientific definition of manual material handling (MMH) is the movement and storage of material at the lowest possible cost through the use of proper method and equipment and can be described as lifting, lowering, pushing, pulling, holding or carrying loads. A large number of workers are injured and often are forced to quit their jobs due to the high stress associated with MMH activities. Almost 60% of the total population of India is directly engaged in manual material handling (MMH) in small and medium organized and unorganized sectors (2). MMH tasks are quiet strenuous as in most cases postures adopted during activity create great pressure on musculoskeletal & cardiovascular systems, which in turn causes different types of accidents (1). In the present study an attempt was made to identify and analyze the probable causes behind manual material handling accidents among the MMH workers.

### 2. Methods

#### 2.1 Selection of subjects:

Fifty (50) male workers engaged in manual material handling at the central market area in Agartala City were randomly selected. Subjects selected for this study had a minimum working experience of at least 5 years.

#### 2.2 Questionnaire study:

A questionnaire on occupational health based on the Modified Nordic Questionnaire (6) was used to carry out this study. A checklist designed by Keyserling et al (5) was used for the evaluation of the ergonomic and work environmental risk factors associated with the MMH task and accidents.

#### 2.3 Analysis of working postures:

The Ovako Working Posture Analysis System (OWAS) (4) was applied with the aid of digital photography for the analysis of working postures. Later on stick diagrams were drawn from freezed frame video records and photographs were analyzed.

#### 2.4 Analysis of accidents from questionnaire and from Hospital Records:

A thorough accident analysis had been performed from personal interview and through the questionnaire response for three months in 2024. These records of the hospital near the central market area were studied and relevant data were collected for analysis of accidents. The details of accidents especially the history of injuries or activities of the subjects during accidents were recorded.

### 3. Results

The mean and SD values of different physical parameters of MMH workers engaged in central market area are shown in Table-1.

**Table 1: Physical Characteristics Of Workers (n= 50)**

	Parameters			
	Age (years)	Height (cm.)	Weight (kg.)	BMI (kg/m <sup>2</sup> )
<b>Mean</b>	35.4	163.9	60.2	22.3
<b>SD (±)</b>	11.57	6.23	8.99	3.44

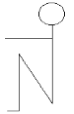


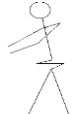

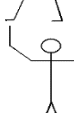


The general information regarding the regular working hours, characteristics of load handling, mode of load handling, frequency of load lifting are presented in the following table (Table -2).

**Table 2: General Information About Work Schedule of the Workers**

General Information	Values
Load lifted by the MMH workers	66.3 (±10.7)
Number of Loads lifted in a day	38.02 (±3.1)
Total amount of load lifted and carried in a day	2659.4 (±8)
Distance covered with load at a time	38.4 (±2.14)
Height climbed from ground to storage area	1.86 (±3.21)
Accident encountered among MMH workers	40 (80%)

The analysis of the working postures of MMH workers are presented in Table 3.

**Table 3: Analysis Of Working Posture During MMH Activity**

Posture No.	Figures	OWAS Code	Action Categories	Remarks
<b>Lifting Phase</b>				
1		1343	3	Corrective measure as soon as possible
2		2143	3	Corrective measure as soon as possible
3		1133	1	NO corrective measure
4		2133	3	Corrective measure as soon as possible
<b>During Carrying</b>				
5		2333	3	Corrective measure as soon as possible
6		1373	2	Corrective measure in near future
<b>During Transferring</b>				
7		2343	4	Corrective measure immediately
8		4373	4	Corrective measure immediately

The occurrence of accidents during different MMH activities is presented in Table 4 (from the questionnaire).

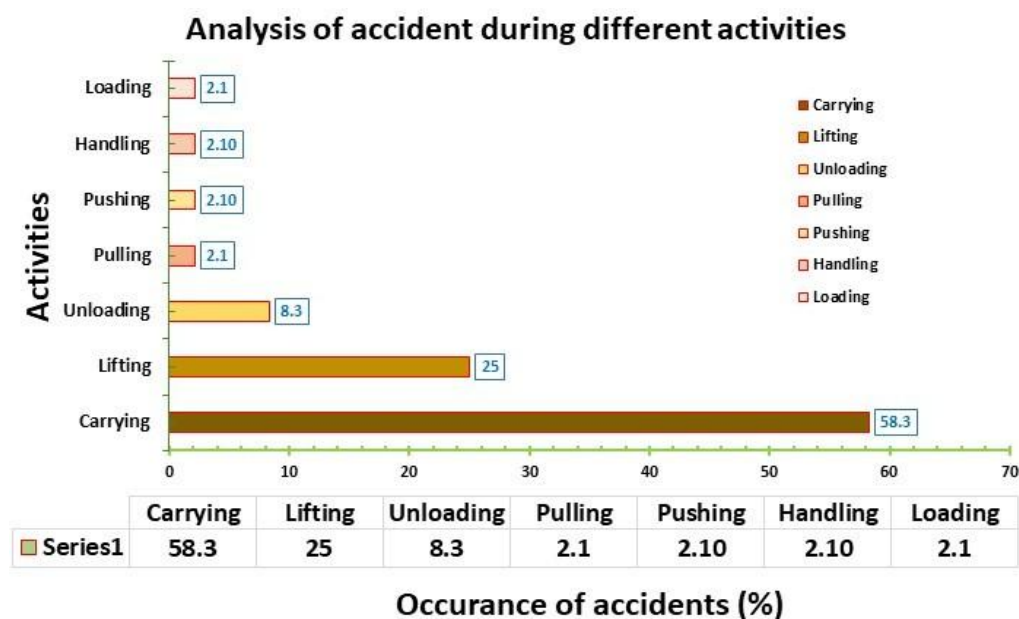
**Table 4: Activities During Accidents Recorded From The Questionnaire (n=40)**

	Activity	Number and (Percentage)
Lifting Phase	Receiving	3 (7.5%)
	Lifting	10 (25%)
	Pulling	1 (2.5%)
	Pushing	1 (2.5%)
Carrying Phase	Carrying	17 (42.5%)
	Moving / Climbing	1 (2.5%)
Transferring Phase	Unloading	5 (12.5%)
	Removing	2 (5%)

Analysis of accident during different activities were recorded from the Govt. Hospital near the central market area and shown in Table-5.

**Table 5: Activities During Accidents (n=48)**

Activities during Accident	Number and (Percentage)
Carrying	28 (58.3%)
Lifting	12 (25%)
Unloading	4 (8.3%)
Pulling	1(2.1%)
Pushing	1 (2.1%)
Handling	1(2.1%)
Loading	1(2.1%)



The type of accidents recorded from the questionnaire and from Hospital record are shown in Table-6. It was further observed that the most predominant accidents were struck by objects.

**Table 6: Type of Accidents Recorded From Questionnaire And From The Hospital Record**

Type of accident	Questionnaire (n=40)	Records (n=48)
	Number and (Percentages)	
Struck by object	19 (47.5%)	23 (47.9%)
Slip and fall	10 (25%)	14(29.2%)
Struck by falling object	8 (20%)	6 (12.5%)
Fall from height	2 (5%)	3 (6.3%)
Caught in / between objects	1 (2.5%)	2 (4.1%)

Overall working environmental conditions including the presence of some pollutants like dust, smoke, and fumes on MMH workers are shown in Table 7.

**Table 7: Responses About Dust Fumes and Smoke In the Marketplace**

Responses	Number and Percentage (%)
Dust	31 (62)
Smoke and Fumes	19 (38)

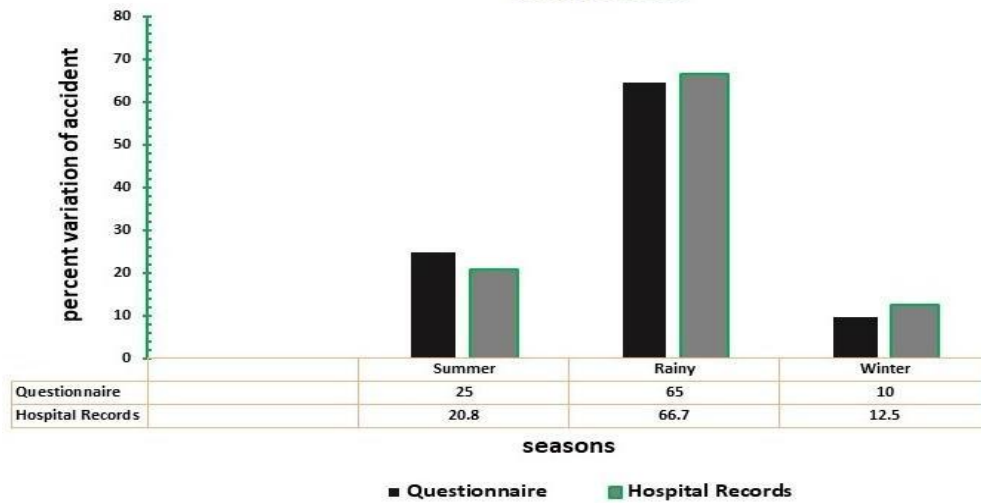
Seasonal variations in the occurrence of different types of accidents are shown in the Table 8.

**Table 8: Seasonal Variation of Accidents From Questionnaire And Hospital Record**

Seasons	Number and (Percentages)	
	Questionnaire	Hospital Records (n=48)

	(n=40)	
Summer	10(25%)	10(20.8%)
Rainy	26 (65%)	32(66.7%)
Winter	4 (10%)	6 (12.5%)

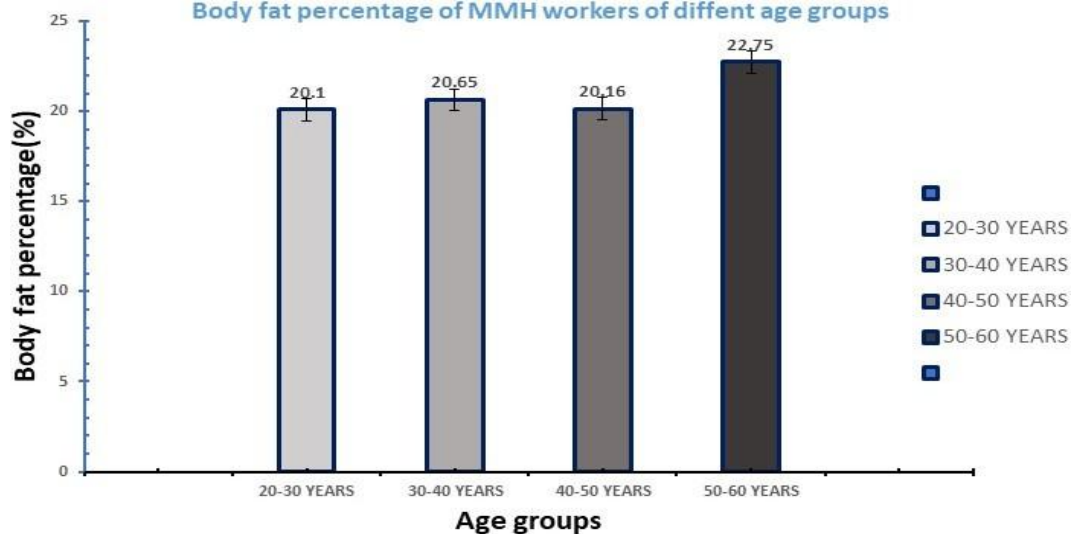
**Seasonal variations in the occurrence of different types of accidents**



**Table 9. Mean Body Fat Percentage of MMH Workers**

Category of BFP level for male	Gender	Age range (years)	No of individuals	Mean BFP (%)	Standard Deviation
10-18 excellent	Male (n= 50)	20-30	10	20.1	(±1.66)
18.1-22.0 good		30-40	20	20.65	(±2.10)
22.1-25.0 fair		40-50	12	20.16	(±2.03)
25-29.0 poor		50-60	8	22.75	(±2.06)
≥29.1 obese		-	-	-	-

**Body fat percentage of MMH workers of different age groups**



#### 4. Discussion and Conclusion

The workers, who participated in the present study, have a normal range of BMI, indicating that they belong to the same physical status. It was observed that the total load lifted by the MMH workers from the ground with the help of other

workers at a time were 66.3 kg and the average frequency of lifting each day was 38.02 times, this value was not corroborating the recommended workload for lifting and frequency by ILO (1981).

On further analysis, it was evident that the postures adopted at lifting of load from the ground and transferring of load at the storage area needed corrective measures immediately; whereas the postures adopted while placing the load over the head, required correction as soon as possible. Thus, it is clear that by remaining in such awkward postures during activities, these workers were exposed to hazards which may cause different types of accidents. This OWAS observation corroborates with the result obtained from the analysis of questionnaire, wherein the workers complained of accidents caused due to different work-related postures; slight disturbances in these postures may contribute to the causation of all these types of accidents. Although the floor inside the market area was quite slippery but these hazardous work postures and improper work modes may be the prime cause of these accidents.

A thorough accident analysis had been performed from personal interview, questionnaire response and from the records of the govt. hospitals near the central market area. Analysis of questionnaire revealed that out of the 50 workers, 40 (80%) of them had encountered with some kind of accidents during handling of load manually. The accidents occurred mainly during carrying, lifting and unloading of heavy load (42.5%, 25% and 12.5% respectively). Almost similar result obtained from the analysis of hospital records where during carrying (58.3%) and lifting (25%) activities accidents were maximum. The predominant accidents were struck by objects and slip and fall as evident from the insufficient workspace and the rough and slippery walking surface. The frictional force generated due to carriage of heavy load, the chappals used by the workers and unevenness of the floor may also account for the fact.

It was revealed from the analysis of questionnaire that most of the MMH workers of the central market area were affected by dust and smoke emitted at their work place which created a huge hindrance at their work and caused accidents. It was further observed that there was a seasonal variation in the occurrence of accidents. It was found that most of the accidents occurred in summer and in rainy seasons. Hot, humid environment and slippery work place during rainy seasons may be the causes of the accidents. From the study, it can be concluded that the faulty work practice with the adoption of awkward working postures during heavy load handling may be regarded as one of the primary causes of accidents leading to permanent disablement and consequent loss of earnings.

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