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## Exploring Health Problems among Lead Acid Storage Battery Workers in Dhaka City, Bangladesh

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### ABSTRACT

This study was cross-sectional in nature. To determine the health issue caused by lead exposure in lead acid storage battery companies, a total of 100 correspondents were questioned and examined. The participants were chosen on purpose from 11 lead acid storage battery facilities in Dhaka. A pretested questionnaire and check list were used by the researcher to gather data. All the interviewees were male and varied in age between 14 to 50. There were 18 participants in the 14 - 18 age cohorts, a group that is particularly susceptible to lead poisoning. According to the report, most factories disregard their own standards. Because the employees manage the lead plate and lead oxide with their bare hands throughout the manufacturing process, lead is frequently contaminated and eventually absorbed through food. 85 out of the 100 responders reported clinically significant symptoms and indications of lead poisoning. Progressive weakness, decreased appetite, constipation, abdominal pain, joint as well as muscular distress, anemia, and anger were among the most prevalent observations. Four respondents had high blood pressure. With the length of the task, the symptoms became more severe. It was discovered that gender as well as clinical manifestations correlated with one another. Additionally, statistically meaningful was the correlation between age and the length of duration of employment and clinical manifestations. Hospital or even other facilities weren't included. The personal hygiene status was found good. About 15% of responders utilized hand gloves, which is a very insufficient level of safety precautions. This investigation was unable to pinpoint any associations among clinical symptoms and past employment history, educational attainment, degree of personal cleanliness, or safety precautions taken.

**Keywords:** Lead acid storage battery, Health problems, Lead poisoning, and Clinical symptoms.

### INTRODUCTION:

An essential potential hazard across all humans and animals on this globe, including those in our native country of Bangladesh, is indeed the environmental metal contamination caused by human activity. It has raised awareness of the danger that heavy metals as lead pose to the biosphere both right now and in the

future due to their invisible effects. In developed countries, lead poisoning no longer occupies the predominant position it once did. By contrast, in developing countries, lead poisoning is still commonplace, and on a worldwide scale it remains the most common of the occupational poisonings. Lead is released into the environment primarily through air by burning of gasoline

and solid wastes and breaking and manufacturing of lead acid storage batteries, the largest used category, tend to be recycled. There is large number of occupations where exposure of lead occurs in our country like lead acid storage battery industries. Lead is also used in organic form as tetraethyl lead and tetramethyl lead in petroleum. This lead is released into environment as inorganic after its impartial combustion by motor vehicles. As a result, lead exposure is a widespread problem. Nevertheless, airborne lead emissions have drastically decreased in recent years. Lead can also be absorbed via contaminated drinking water, fish, meat, vegetables, fruit, and nails and skin (Biswas *et al.*, 2021).

In Bangladesh, a small number of individuals engage in the lead acid storage battery industry. Most of such firms don't really adhere to factory policies and procedures, and the workers handle hazardous materials like lead and Sulphuric acids without being aware of the risks. The lead batteries are made and broken using traditional methods. In order to recover the lead and plastic within, the battery is broken. Metallic lead plates coated with lead oxide and lead sulphate are separated out from plastic casing using processes that commonly expose workers to lead fumes and dust. To decrease the battery, torches are used to cut through the outer case, creating additional lead fumes, nails and skin contamination also occurs during manufacturing process of the battery. The impact of lead on health is generally cumulative. As a result, prolonged exposure to trace amount of lead is dangerous for human body. In accordance with toxicity and data obtained from clinical investigations and various other studies such as animal experiments, very low allowable limit has been recommended by various regulatory authorities for lead in working place and environment (Nahid *et al.*, 2019).

The purpose of the current study was to ascertain how lead exposure affected some of the impacted individuals' health. In order to determine size of the issue may be determined and the appropriate actions can be taken.

### **Justification of This Study**

There are no lead mines in Bangladesh. All lead is sourced from abroad and used after being smelted. The majority of the lead is imported in various lead compounds. In our nation, many occupations, such as those

that produce lead acid storage batteries, expose workers to lead. Lead and lead compounds have been utilized by painters, composers for printing presses, workers who grind with power equipment, welders, and other employees in foundries. Tetraethyl and tetramethyl lead are organic forms of lead that are also utilized in petroleum. This lead is released in the environment as inorganic after its impartial combustion by Motor vehicles. As a result, lead is exposed to a vast population. However, due to greater usage of unleaded gasoline as well as gradual limits on the lead level of gasoline, emissions of lead into the air have substantially decreased in recent years. Lead can also enter the body via contaminated drinking water, fish, meat, vegetables, fruit, and nails and skin. In Bangladesh there are some people working in Lead acid storage battery factories and most of these factories do not follow the factory acts and rules and use conventional method to manufacture as well as breaking the lead battery. Exposure to lead fumes and dust routinely occur during manufacturing. Nails and skin contamination also occurs. In abroad some studies were done on lead acid storage battery workers but there was no such study yet done in Bangladesh. The study's findings will aid in determining the scope of the issue, and they may also offer recommendations for improving the working environment and raising awareness of the negative effects of lead exposure within the study group (Alam and Bahauddin, 2015).

### **Research Question**

Major health problems amongst lead acid storage battery workers.

### **Objectives**

#### **A. General Objective**

To identify the health problems amongst lead acid storage battery workers.

#### **B. Specific Objective**

- 1) To identify the morbidities amongst lead acid storage Battery workers.
- 2) To identify the morbidities in relation to the duration of working hours and length of job duration.
- 3) To find out the number of workers using personal protective device and maintaining personal hygiene.
- 4) To determine the socio demographic characteristics of lead acid storage battery workers.

## Variable

In the study following variables were considered.

### Dependent Variable

Sign and symptoms attributable to lead poisoning

- 1) Haemopoietic system: Anemia
- 2) Nervous system: Muscle and joint pain  
Progressive weakness  
Full drop wrist drop  
Tremor.
- 3) G. I. system: Loss of appetite.  
Blue line along the gum  
abdominal pain  
Vomiting  
Diarrhea  
Constipation
- 4) Cardiovascular system: Hypertension

### Independent Variable

- 1) Age
- 2) Sex
- 3) Marital Status
- 4) Duration of exposure
- 5) Working hours.
- 6) Educational qualification.
- 7) Income
- 8) Exposure in previous occupation
- 9) Safety measures.
- 10) Personal hygiene
- 11) Medical facilities.
- 12) Other facilities.

### Operational Definition

Progressive weakness: Complain of weakness which is increasing day by day after joining the job.

Lead colic/ Abdominal pain: Occurrence of cramping pain in the abdomen which is localized around of bellow the umbilicus after joining the job.

Lead Line: Blue or grey pigmented line may be present on the dental margin of the gums which is associated with poor dental hygiene with lead exposure.

Lead acid storage battery workers: The Workers who are primarily concerned with manufacturing process and breaking of lead acid storage battery.

Wrists drop/Foot drop: Asked and examined the patient it there was any loss of sensation, weakness or paralysis of hand or food.

Neurological or psychological problem: Asked the patient about complain of lethargy, slowness of performance, excessive sleep, confusion, mania and change of personality after joining the job.

Personal hygiene: Total six questions were asked to the participants to assess the personal hygiene. Each answer to the question carried 1 point for “no” and 2 points for “yes” then summations of pints were done, and the status of personal hygiene was classified as - Poor hygiene:  $\leq 8$ ; Moderate hygiene: 9.10; and Good hygiene: 11.12.

## MATERIALS AND METHODS:

### Study Design

It was a cross sectional study.

### Study Area

The study was carried out in 11 lead acid storage factories in Dhanmondi, Mohammedpur and Waizghat of Dhaka city.

### Study Period

The study was conducted over a period of 12 weeks extending from 1<sup>st</sup> January to 30<sup>th</sup> March 2017. For convenience of work a schedule of activity (workflow chart) was prepared at the beginning of the study and assignments were accomplished as per schedule.

### Study Population

The study population included the workers who are primarily concerned with manufacturing process and breaking of lead acid storage battery.

### Sampling Technique

Purposive sampling technique has been followed in this study. A total 100 samples were collected.

### Sample Size

Before starting my data collection I estimated that I could collect data from 8-10 respondents per day. I collected data from the respondents for 10 days. In this way the sample size became 100.

### Data Collection Tools

Inclusion of all key variables as per general and specific objective of the study, a questionnaire was developed and pretested and required alternation and modified were made. A check list was also made to collect the physical findings regarding anaemia. Tremor and blood pressure.

**Data Collection Method**

Data collection was done by the researcher himself. Before interviewing, the purpose of the study was explained to the respondent and verbal consent taken from the respondent. Questionnaire part was filled in through direct interview and physical examination was done including measurement of blood pressure.

**Data Analysis**

The collected data were checked for any errors then edited and entered the computer in SPSS Version 11.5 and necessary analysis was done and Statistical test of significance also done where necessary.

**RESULTS:**

**Table 1:** Distribution of the respondents by Age and Sex (Mean of Age= 23.80 years and SD= 6.35 years).

Sl. No.	Name of Variables	No. of Respondents	Percentage
1`	Age (in groups)		
	≤20 years	33	33%
	21-30 years	54	54%
	>30 years	13	13%
2	Gender		
	Male	100	100%
	Female	0	0.0%

Out of 100 respondents it was found that in age group of ≤20 years. Number of respondents were 33 (33.0%), in the age group 21- 30 years. Respondents were 54 (54%) and in the age group >30 years respondents were only 13 (13%). These findings show that highest percentage lie in the age group of 21- 30 years which

is the main working population in the lead acid storage battery factories. The mean age of the study population was 23.80 years with SD 6.35. The minimum age was 14 years and the maximum age was 50 years. Out of 100 respondents there was no female worker.

**Table 2:** Distribution of respondents by religion and marital status.

Sl. No	Name of Variables	No. of Respondents	Percentage
1	<b>Religion</b>		
	Islam	86	86%
	Hindu	14	14%
2	<b>Marital Status</b>		
	Married	38	38%
	Unmarried	62	62%

The total population 100 shows that 86 (86%) were Muslims and 14 (14%) were Hindu. On the basis of marital status, the study population was classifying in-

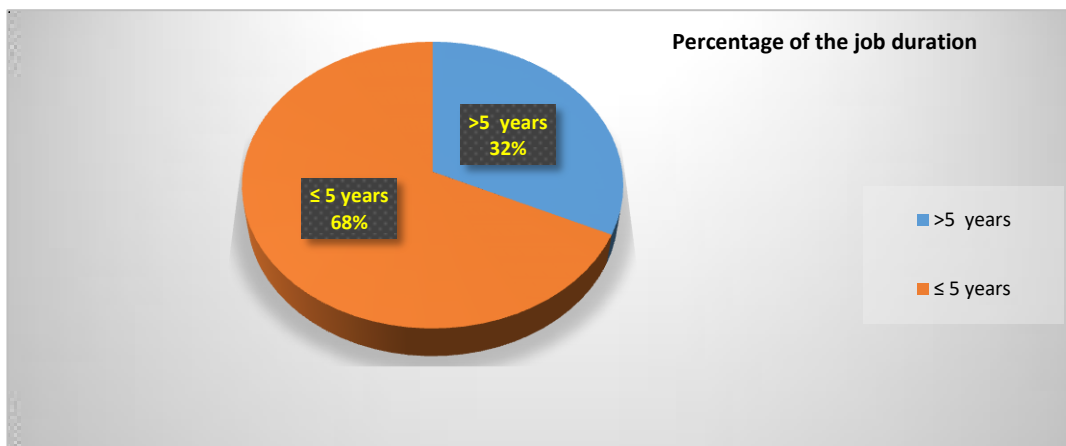
to married and unmarried among which majority were unmarried 62 (62%) and 38 (38%) were married.

**Table 3:** Distribution of the respondent by educational status & monthly income (Mean= 2574.16 Tk SD=1252.66).

Sl. No	Name of Variables	No. of Respondents	Percentage
1	<b>Educational Status</b>		
	Illiterate	8	8%
	Class 1-5	50	50%
	Class 6-10	42	42%
2	<b>Monthly income</b>		
	≤2000 Tk	38	38%
	2001-3000 Tk	31	31%
	3001-4000 Tk	15	15%
	>4000 Tk	16	16%

The educational status of the respondents shows that only 8 (8%) were illiterate and majority of the respondents 50 (50%) were in the group of class and 42 (42%) were in the group of class 6 - 10. The monthly income of the respondents of the study indicates that

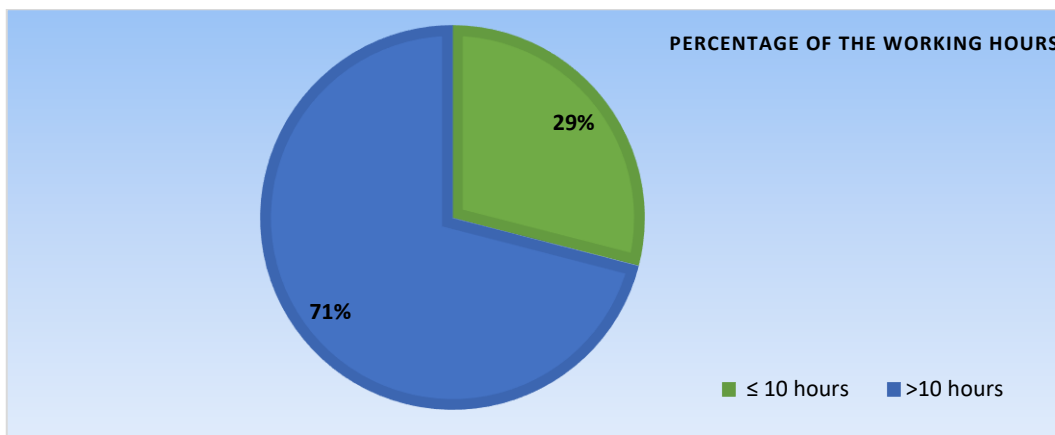
38 (38%) had monthly income less than 2000tk 31(31%) had monthly income of 2001- 3000 Tk, 15 (15%) had 3001- 4000 Tk and 16 (16%) workers had income over 4000 Tk.



**Fig. 1:** Distribution of the respondent according to their duration of job in lead acid storage battery factory.

Mean= 6.06 years with SD 6.08; Min duration 3 Months and max duration 28 years. **Fig. 1** Shows that out of 100 respondents 68 (68%) had work experience in lead acid storage battery factory equals or less than 5 years and 32 (32%) had work experience more than 5

years. **Fig. 2** shows that 29 (29%) respondents had equal or less than 10 hours of working duration and 71 (71%) had more than 10 hours of working duration. The mean working duration was 11.05 hours with SD 1.66.



**Fig. 2:** Distribution of the respondents according to their working hours.

**Table 4:** Distribution of respondents by their previous work experience.

Previous work Experience	Frequency	Percentage
Battery Making	9	22%
Cultivator	9	22%
Motor garage workers	6	14.59%
Shop keeper	6	14.59%
Lead worker	4	9.75%
Others	7	17.07%
Total	41	100%

**Table 4** shows that previous work experience of the respondents, out of 100 respondents 41 (41%) had previous work experience among them 9 (22%) respondents worked at lead acid storage battery factory, 9 (22%) were cultivators, 6 (14.59%) were motor garage

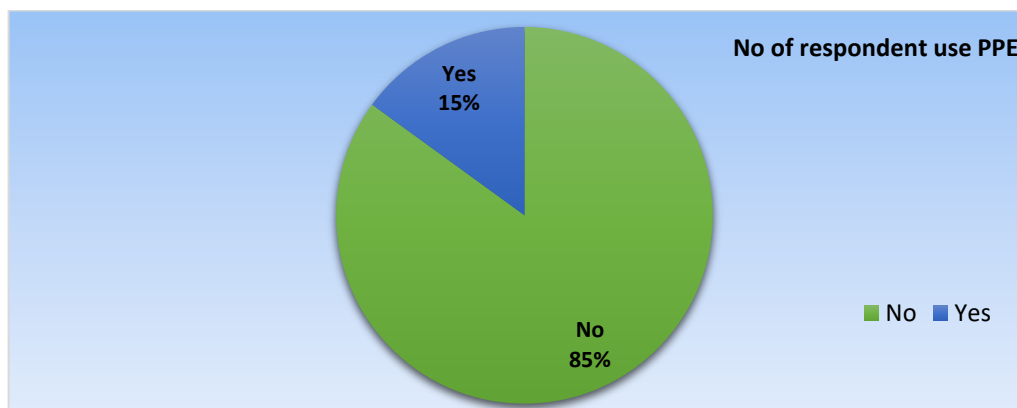
workers, 6 (14.59%) were shop-keepers, 4 (9.75%) were lead workers and 7 (17.07%) respondents came from other occupations which include rickshaw puller 2, leather factory worker 2, carpenter 1, press worker 1 and a truck helper.



**Fig. 3:** Distribution of the respondents according to the result of Personal Hygiene.

**Fig. 3** shows the status of personal hygiene. Out of 100 respondents 3 had poor hygiene, 13 (13%) had moderate

hygiene and the majority 84 (84%) had good personal hygiene status.



**Fig. 4:** Distribution of respondents by using Personal Protective Equipment (PPE).

**Fig. 4** shows that the safety measure taken by the respondents in working place out of 100 respondents 15

(15%) used personal protective equipment (PPE) whereas 85 (85%) did not use PPE.

**Table 5:** Distribution of the respondents according to their sign and symptoms.

Signs and symptoms	Yes	No	Duration in month				Total
			Mean	SD	Min	Max	
Progressive Weakness	74(74%)	26 (26%)	13.14	15.49	1	96	100
Loss of Appetite	46(46%)	54 (54%)	12.36	16.03	1	60	
Constipation	53(53%)	47 (47%)	10.23	13.20	1	60	
Abdominal Pain	28(28%)	72 (72%)	14.50	23.21	1	96	
Muscle and Joint Pain	26(26%)	74 (74%)	14.44	15.06	1	60	
Anaemia	57(57%)	43 (43%)	-	-	-	-	
Tremor	13(13%)	87 (87%)	37.15	46.33	3	180	

Out of 100 respondents 74 (74%) had progressive weakness with mean duration of 13.14 months and SD 15.49, 46 (46%) had a loss of appetite with mean duration of 12.36 months and SD 16.03, 53 (53%) had constipation with mean duration of 10.23 months and SD 13.20, 28 (28%) had abdominal pain with mean duration of 14.50 months and SD 23.21, 26 (26%) had muscle and joint pain with mean duration of 14.44 months and SD 15.06, 57 (57%) had anaemia and 13 (13%) tremor with mean duration of 37.15 months and SD 46.33.

The minimum duration was 1 months for all symptoms except tremor which was 3 months and maximum duration was 96 months for progressive weakness and abdominal pain, 60 months for constipation, muscle and joint pain and loss of appetite 180 months for tremor. The above findings indicate most of the respondents complained of progressive weakness and the lowest no of respondents complained of tremor. The bar chart (Fig. 5) was drawn from Table 5 showing the frequency of positive signs and symptoms.

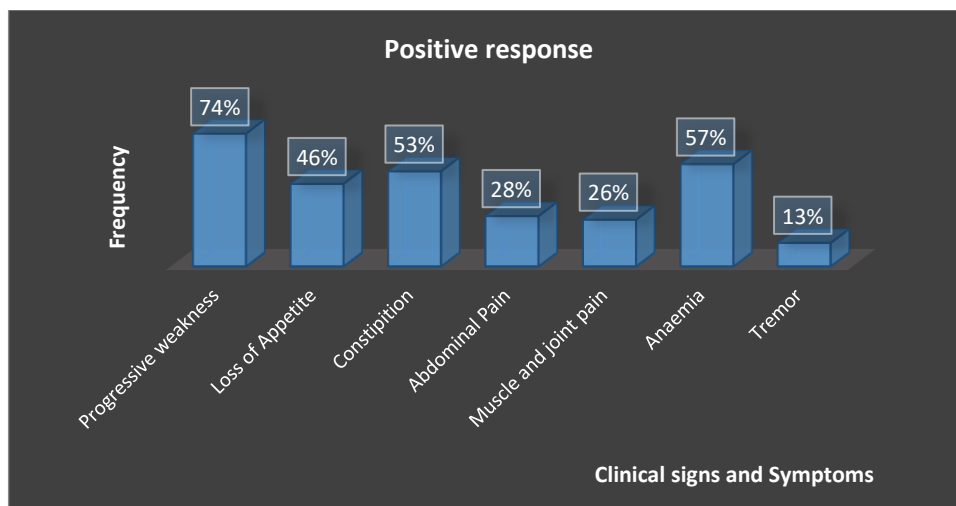


Fig. 5: Distribution of respondents by Clinical signs and symptoms.

Table 6: Distribution of the respondents by systolic and diastolic BP.

	Category of diastolic BP		Category of systolic BP	
	<90 mm of Hg	>90mm of Hg	<130mm of Hg	>130 mm of Hg
Frequency	96	4	73	27
Percentage	96%	4%	73%	27%

Out of respondents 96 (96%) had diastolic pressure less than 90mm of Hg and 4 (4%) had more than 90mm of Hg. In case of systolic pressure 73 (73%) had less than 130mm of Hg and 27 (27%) had more than 130mm

of Hg. The above result shows that 4 respondents had hypertension whose diastolic pressure had more than 90 mm of Hg.

Table 7: Distribution of respondents by Age and clinical signs and symptoms.

Duration of Job in years	Progressive Weakness		Loss of Appetite		Constipation		Abdominal Pain		Muscle and joint pain		Anaemia		Tremor	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
≤20 years	44	24	29	39	29	39	12	56	6	62	31	37	2	66
21-30 years	48	6	28	26	39	15	19	35	15	39	40	14	9	45
>30 years	12	1	9	4	7	6	6	7	9	4	10	3	3	10
Total	74	26	46	54	53	47	28	72	26	74	57	43	13	87
X <sup>2</sup> Value	9.54		0.962		9.14		11.30		32.58		11.29		19.01	
P Value	0.000		0.016		0.000		0.009		0.000		0.000		0.095	

Out of 100 respondents the age group below 20 years, 14 (42.42%) had progressive weakness, 9 (27.2%) had loss of appetite, 7 (21.2%) had constipation, 3 (9.09%) had abdominal pain, 2 (6.0%) had muscle and joint pain, 7 (21.2%) had anaemia and 1 (3.03%) had tremor. Age group between 21-30 years 48 (88.88%) had progressive weakness, 28 (51.85%) had loss of appetite, 39 (72.22%) had constipation, 19 (35.18%) had abdominal pain, 15 (27.77%) had muscle joint pain, 40 (74.07%) had anaemia and 9 (69.23%) had tremor.

Age group of above 30 years 12 (92.30%) had progressive weakness, 9 (69.23%) had loss of appetite, 7 (53.85%) had constipation, 6 (46.15%) had abdominal pain, 9 (69.23%) had muscle and joint pain, 10 (76.93%) had anaemia and 3 (23.07%) had tremor. The table indicates the maximum frequency of clinical signs and symptoms were in the age grouped between 21-30 years. The statistical result shows significant association between age and clinical signs and symptoms except for tremor.

**Table 8:** Distribution of the respondents by Job duration and clinical signs and symptoms.

Duration of Job in years	Progressive Weakness		Loss of Appetite		Constipation		Abdominal Pain		Muscle and joint pain		Anaemia		Tremor	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
≤5Yrs	44	24	29	39	29	39	12	56	6	62	31	37	2	66
>5yrs	30	2	17	15	24	8	16	16	20	12	28	6	11	21
Total	74	26	46	54	53	47	28	72	26	74	57	43	13	87
X <sup>2</sup> Value	9.54		0.962		9.14		11.30		32.58		11.29		19.01	
P Value	0.002		0.3237		0.002		0.001		0.000		0.001		0.000	

The respondents who worked in Lead acid storage battery factory less than 5 years. Among them 44 (64.70%) had progressive weakness. 29 (42.64 %) had loss of appetite, 29(42.64%) had constipation, 12(17.65%) had abdominal pain, 6(8.82%) had muscle and joint pain, 31(45.58%) had anaemia and 2 (3.0%) had tremor. The respondents who worked more than 5 years 30 (93.75%) had progressive weakness, 17 (53.12%)

had loss of appetite, 24 (75.0%) had constipation, 16 (50.0%) had abdominal pain, 20 (62.50%) had muscle and joint pain 26 (81.25%) had anaemia and 11 (34.38%) had tremor. The result suggests that more duration of job, the more prevalence of clinical signs and symptoms except for loss of appetite and this association was also statistically significant.

**Table 9:** Distribution of respondents by number of clinical symptoms and job duration.

Duration of job in years.	≤ 3 Symptoms	4-5 symptoms	>5 symptoms	Total
≤5 years	34	18	2	54
>5years	7	12	12	31
Total	41	30	14	85

X<sup>2</sup> = 1.47, P= 0.000 **Table 9** shows that the respondents who had less than 5 years job experience, among them 34 (62.00%) had less than 3 symptoms, 18(33.3%) had 4-5 symptoms, 2 (3.70%) had more than 5 symptoms and the respondents who had more than 5 years.

Job experience 7 (22.5%) had less than 3 symptoms, 12(38.70%) had 4-5 symptoms and 12 (38.70%) had more than 5 symptoms. There is a positive association between length of job duration and frequency of symptoms which was also statistically significant.

**Table 10:** Distribution of the respondents by working hours and clinical signs and symptoms.

Working hours	Progressive Weakness		Loss of Appetite		Constipation		Abdominal Pain		Muscle & joint pain		Anaemia		Tremor	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
<10 hours	20	9	8	21	11	18	8	21	6	23	14	15	4	25
>10 hours	54	17	38	363	42	29	20	51	20	51	43	28	9	62
Total	74	26	46	54	53	47	28	72	26	74	57	43	13	87



The respondents whose work duration were less than 10 hours among them 20 (68.96%) had progressive weakness, 8 (27.58%) had loss of appetite, 11 (37.93%) had constipation, 8 (27.58%) had abdominal pain, 6(20.68%) had muscle and joint pain, 14 (48.27%) had anaemia and 4 (13.79%) had tremor and the respondents whose work duration were more than 10 hours among them 54 (76.05%) had progressive weakness, 38(53.52%) had loss of appetite, 2(59.15%) had constipation,

20(28.16%) had abdominal pain 20 (28.16%) had muscle and joint pain , 43(60.56%) had anaemia and 9(12.67%) had tremor. The **Table 10** shows that the respondents whose work duration more than 10 hours had more positive clinical signs and symptoms but the result fails to demonstrate any statistically significant association between working hours and clinical signs and symptoms.

**Table 11:** Distribution of the respondents by previous work experience and clinical signs and symptoms.

Previous experience	Progressive Weakness		Loss of Appetite		Constipation		Abdominal Pain		Muscle & joint pain		Anaemia		Tremor	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Battery workers	8	1	6	3	5	4	5	4	6	3	8	1	2	7
Motor garage workers	5	1	4	2	5	1	4	2	3	3	5	1	1	5

The respondents who previously worked in lead acid storage battery factory, among them 8(88.8%) had progressive weakness, 6(66.6%) loss of appetite, 5(55.5%) had constipation, 5(55.5%) had abdominal pain, 6(66.6%) had muscle and joint pain, 8(88.8%) had anaemia and 2(22%) had tremor. The respondents who were previously motor garage workers, among them

5(83.33%) had progressive weakness, 4(66.6%) loss of appetite, 5(83.3%) had constipation, 4(66.6%) had abdominal pain, 3(50.0%) had muscle and joint pain, 5(83.3%) had anaemia and 1 (16.66%) had tremor. The results fail to show statistically significant association between previous work experience and clinical signs and symptoms.

**Table 12:** Distribution of the respondents according to their level of education and clinical signs and symptoms.

Level of education	Progressive Weakness		Loss of Appetite		Constipation		Abdominal Pain		Muscle & joint pain		Anaemia		Tremor	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Illiterate	7	1	6	2	6	2	1	7	1	7	4	4	0	8
Class 1-5	32	18	17	33	21	29	7	43	9	41	22	28	4	46
Class 6-10	35	7	23	19	26	16	20	22	16	26	31	11	9	33
Total	74	26	46	54	53	47	28	72	26	74	57	43	13	87

8 respondents were illiterate among which 7(87.50%) had progressive weakness, 6(75.0%) had loss of appetite, 6(75.0%) had constipation, 1 had (12.50%) abdominal pain, 1 (12.50%) had muscle and joint pain, 4(50.0%) had anaemia and tremor was absent. The respondents who were in the group of class 1-5 among them 32(64.0%) had progressive weakness, 17(34.0%) had loss of appetite, 21(42.0%) had constipation, 7 had (14.05) abdominal pain, 9(18.0%) had muscle and joint pain, 22(44.0%) had anaemia and 4(8.0%) had tremor. Among the respondents who were in the group of class 6-10 among which 35(83.0%) had progressive weakness, 23(54.0%) had loss of appetite, 26(61.90%) had constipation, 20(47.61%) had abdominal pain, 16(38.09%) had muscle and joint pain, 31(73.80%) had anaemia and 9(21.42%) had tremor. The **Table 12** shows that the prevalence of clinical signs and symptoms were more among class group of 6-10 than that of other but the result failed to demonstrate the significant statistical association based education level and clinical signs and symptoms.

The **Table 12** shows Out of 100 respondents 15 used PPE among them 12 (80.0%) had progressive weakness 10(66.66%) had loss of appetite, 9(60.0%) had constipation, 5 (33.34%) had abdominal pain, 7(46.66%) had muscle and joint pain 10 (66.66%) anaemia 5 (33.33%) had tremor 85 respondents did not use PPE. In 62(72.35%) had progressive weakness 36 (42.35%) had loss of app (51.76%) had constipation,

22(27.05%) had abdominal pain, 19(22.35%) muscle and joint pain 47 (55.29%) had anaemia and 8 (9.41%) had tremor was no significant statistical association between clinical symptoms and PPE.

**Table 13:** Distribution of the respondents by using PPE and clinical signs and symptoms.

Using PPE	Progressive Weakness		Loss of Appetite		Constipation		Abdominal Pain		Muscle & joint pain		Anaemia	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Yes	12	3	10	5	9	7	5	10	7	8	10	5
No	42	23	36	49	44	40	23	62	19	68	47	38
Total	74	26	46	54	53	47	28	72	26	74	57	43

**Table 14:** Distribution of the respondents by personal hygiene status and clinical signs and symptoms.

Level of personal Hygiene	Progressive Weakness		Loss of Appetite		Constipation		Abdominal Pain		Muscle & joint pain		Anaemia		Tremor	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Poor Hygiene	2	1	2	1	1	2	0	3	0	3	2	1	0	3
Moderator Hygiene	11	2	9	4	10	3	6	7	5	8	10	3	5	8
Good Hygiene	61	23	35	49	42	42	22	62	21	63	45	39	8	76
Total	74	26	46	54	53	47	28	72	26	74	57	43	13	87

**Table 14** shows that the prevalence of clinical signs and symptoms had more in the respondents who were amongst the group of moderate hygiene but there was no significant statistical association obtained between clinical symptoms with the status of personal hygiene.

**DISCUSSION:**

There were total 100 respondents included in this study who worked in lead acid storage battery factory. The respondents were selected purposively from 11 lead acid storage battery factories in Dhaka city. The study revealed that during manufacturing process the workers handle the lead plate, lead oxide with naked hands so frequent lead contamination occurs which ultimately ingested with food. **Table 1** revealed all respondents were male ages ranging from 14-50 years and majority was in the age group of 21-30 years. It is noted that there were 18 respondents among the age group of 14-18 yrs. Who are the vulnerable group prone to lead poisoning? **Table 5** shows the prevalence of positive signs and symptoms attribute to lead poisoning which included Progressive weakness (74.0%) with mean duration of 13.14 months, loss of appetite (46.0%) with mean duration of 12.36 months, constipation (53.0%) with mean duration of 10.23 months, abdominal pain (28.0%) with mean duration of 14.50 months, muscle and joint pain (26.0%) with mean duration of 14.44 months, tremor (13.0%) with mean duration of 37.15 months and anaemia (57.0%). Two

of the studies were conducted in secondary lead smelters who smelted lead from used automobile storage batteries. The first of these smelters was located in Memphis, Tennessee and employed 84 workers. The second smelter, in Salt Lake City, Utah and employed only 30 workers. Critical manifestations of lead poisoning were evident in both plants. The dominant findings were colic, gastrointestinal symptoms, anorexia, fatigue, myalgia, joint pain and extensor muscle weakness which are like my study findings. **Table 6** shows that 4 respondents were found hypertensive whose diastolic blood pressure was above 90 mm Hg. Recently hypertension is defined as diastolic pressure 90 mm of Hg or above. A study was conducted to determine the lead level in blood in a lead acid storage battery in Sudan. Total 70 workers had weakness, constipation and muscle and joint pain; 6(8.57%) workers were found hypertensive (Gottesfeld & Pokhrel, 2011).

**Table 8** and **9** shows that 68 respondents worked in lead acid storage battery less than 5 years and 32 respondents worked more than 5 years. There was a positive relationship between length of job duration and clinical signs and symptoms. The more duration means more exposure to lead hence there were more prevalence of clinical signs and symptoms found, and this was also statistically significant except for loss of appetite. But the **Table 10** revealed no association between working hours and clinical symptoms.

**Table 7** shows there were a positive relationship between age and clinical signs and symptoms and this association was also statistically significant except for tremor. **Table 4** and **Table 11** show the previous work experience where 9 workers worked in motor garage workshop. Lead exposure also occurs in motor garage workshop. The other previous work experience of the respondents was not significant in relation to lead exposure. So total 15 respondents had previous lead exposure and it was found that the pre-valence of clinical signs and symptoms were more in these groups. **Fig. 4** and **Table 4** shows the status of personal hygiene where maximum respondents (84.0%) had good hygiene, (13.0%) had moderate hygiene and only (3.0%) had poor personal hygiene status. No relationship was found between status of personal hygiene and clinical symptoms. **Table 11** shows that clinical symptoms were more prevalent in the group of class 6-10 but no significant association was obtained between educational status and clinical symptoms. **Fig. 5** shows the safety measures taken by the respondents. Out of 100 respondents only 15 used hand gloves and 85 respondents did not use any PPE so during manufacturing process frequent lead contamination occurs which ultimately ingested with food.

To de-case the battery, torches are used to cut through the outer case, creating additional lead fumes which are inhaled. There were no provisions for medical or other facilities for the workers hence it was not shown in the table (Majumder *et al.*, 2021; Ahmad *et al.*, 2019).

#### **CONCLUSION:**

This research has discovered that employees are commonly contaminated to lead during the production of lead acid storage batteries. Out of 100 respondents 85(85.0%) had positive clinical signs and symptoms attributable to lead exposure. The dominant findings were progressive weakness, loss of appetite, constipation, abdominal pain, muscle and joint pain, anaemia and tremor. 4 respondents were found hypertensive. There were positive associations between clinical signs, symptoms with the length of job duration and Age of the respondents though there was no relationship found between clinical symptoms with working hours. The research was unable to determine a correlation across clinical symptoms and past employment

history, educational attainment, degree of personal hygiene, or safety precautions taken. There was no provision for medical or other facilities. The personal hygiene status was good, 84(84.0%) respondents had good personal hygiene. The safety measures taken by the respondents was very poor, only 15(15.0%) used hand gloves. The study's findings could be contested for a variety of reasons, including the lack of a control group, the study's tiny sample size, the no specificity of the favorable clinical manifestation, and the absence of assessment of the participants' blood lead levels. Besides all above lacking it was an attempt to find out the health problems amongst lead acid storage battery workers in Bangladesh. The study result will help to magnitude of the problem and may provide necessary guidelines for improvement of working environment and to make awareness in the study population about the health hazard of lead exposure and be useful for formulating recommendation in preventing lead exposure in battery workers and this surely will also inspire us for further research (Khan and Saadat, 2019).

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#### **CONFLICTS OF INTEREST:**

The authors state that they don't appear to have any friction of part related to the study.

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