



# **Assessment of toxic heavy metals contamination in water collected from different selected sites of the Karnaphuli River, Chattogram, Bangladesh**

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**A thesis submitted in the partial fulfillment of the requirements for the degree of  
Master of Science in Food Chemistry and Quality Assurance**

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**JUNE, 2019**

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June, 2019

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**This is to certify that we have examined the above Master's thesis and have  
found that is complete and satisfactory in all respects, and that all revisions  
required by the thesis examination committee have been made**



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***DEDICATED TO  
MY RESPECTED AND BELOVED  
PARENTS AND TEACHERS***

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## TABLE OF CONTENTS

CHAPTER			PAGE
	Authorization		II
	Signature page		III
	Acknowledgements		V
	Table of Contents		VI
	List of tables		VIII
	List of figures		IX
	Acronyms used		X
	Abstract		XI
Chapter-1	<b>INTRODUCTION</b>		<b>01-04</b>
	1.1	Objectives	03
	1.2	Anticipated outcomes	04
Chapter-2	<b>REVIEW OF LITERATURE</b>		<b>05-21</b>
	2.1	Water quality	05
	2.2	Water pollution	06
	2.3	Heavy metals	07
	2.3.1	Introduction	07
	2.3.2	Influence of heavy metals on human and environmental pollution	08
	2.3.3	Heavy metals effect on water quality	12
	2.4	Sources of heavy metals	14
	2.4.1	Natural processes	14
	2.4.2	Anthropogenic processes	16
	2.5	Heavy metals and their effects	18
	2.5.1	Lead	18
	2.5.2	Chromium	19
	2.5.3	Nickel	20
	2.6	Prevalence of lead, nickel and chromium in water	21
	2.7	Risk factors for the presence of lead, nickel and chromium in water	21

Chapter-3	<b>MATERIALS AND METHODS</b>		<b>23-29</b>
	3.1	Study Area	23
	3.2	Study period	24
	3.3	Water samples collection	24
	3.4	Sample analysis	25
	3.4.1	Preliminary treatment of samples for heavy metal determination	25
	3.4.2	Analytical Techniques	25
	3.4.2.1	Atomic Absorption Spectrometry (AAS)	25
	3.5	Statistical analysis	29
Chapter-4	<b>RESULTS</b>		<b>30-33</b>
	4.1	level of toxic metals in water	30
	4.2	Mean concentration of heavy metals in water	30
Chapter-5	<b>DISCUSSION</b>		<b>34-42</b>
	5.1	General	34
	5.2	Variation of heavy metal concentration among different sites of KR	34
	5.3	Concentration of Lead (Pb) in water	36
	5.4	Concentration of Chromium (Cr) in water	37
	5.5	Concentration of Nickel (Ni) in water	38
	5.6	Comparison of average mean concentration of metals with international standard	40
	5.7	Impact of human activities and catastrophic events on heavy metal accumulation	41
Chapter-6	<b>CONCLUSION</b>		<b>43-44</b>
Chapter-7	<b>RECOMMENDATIONS AND FUTURE PERSPECTIVES</b>		<b>45-47</b>
Chapter-8	<b>REFERENCES</b>		<b>48-58</b>
	<b>APPENDIX</b>		<b>59-66</b>
	<b>BRIEF BIOGRAPHY</b>		<b>67</b>

<b>LIST OF TABLES</b>
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<b>NO. OF TABLES</b>	<b>SL. NO.</b>	<b>NAME OF THE TABLE</b>	<b>PAGE NO.</b>
01	2.1	Shows metal limits ( $\mu\text{g/l}$ ) in water set by national and international organization	14
02	2.2	Sources of heavy metal pollutants in water	15
03	3.1	The sampling locations and its tidal condition	24
04	4.1	Mean concentration of heavy metals in water of KR at selected sites	30
05	5.1	Variation of heavy metal concentration among different regions	35
06	5.2	The location of the water pollution responsible industries	39
07	5.3	The type and number of industries close to Karnaphuli River	39
08	5.4	Comparing total mean concentration of metals in all stations with WHO standards	40



## LIST OF FIGURES

NO. OF TABLES	SL. NO.	NAME OF THE TABLE	PAGE NO.
01	2.1	Major pathways of heavy metal and metalloid dispersion and human exposure in Bangladesh.	9
02	2.2	Impacts of heavy metals on the environment	10
03	2.3	Neurotoxic effects of heavy metal	12
04	2.4	Sources and sinks of heavy metals	16
05	2.5	Sources of heavy metals and their cycle in the environment	17
06	3.1	Geographical location of study area and sampling points	23
07	3.2	Diagram to illustrate instrumentation of AAS	26
08	3.3	Calibration curve of Lead (Pb)	27
09	3.4	Calibration curve of Nickel (Ni)	28
10	3.5	Calibration curve of Chromium (Cr)	28
11	4.1	Mean concentration of lead (Pb) in samples compared with WHO standard	31
12	4.2	Mean concentration of Cr in samples compared with WHO standard	32
13	4.3	Mean concentration of Nickel (Ni) in samples compared with WHO standard	33
14	5.1	Population, population density by residence and urban area/built-up in Chattogram in the last 30 years	42

## LIST OF ACRONYMS AND SYMBOLS USED

<b>Abbreviation and symbols</b>	<b>Elaboration</b>
%	Percent
°C	Degree Celsius
BDL	Below Detection Limit
KR	Karnaphuli River
CVASU	Chittagong Veterinary and Animal Sciences University
SD	Standard Deviation
WHO	World Health Organization
EU	European Union
BSTI	Bangladesh Standard and Testing Institution
USPEA	United States Para-Equestrian Association
APHA	American Public Health Association
AAS	Atomic Absorption Spectrometry
Pb	Lead
Cr	Chromium
Ni	Nickel
Cd	Cadmium
Cu	Copper
As	Arsenic

## Abstract

Heavy metal pollution of water arising from anthropogenic sources continue to become a great challenge to human and aquatic population. In Chattogram, conflicts arising from industrials wastages, a growing population without proper sewerage facilities, increase in the number of aging automobiles, fertilizers and pesticides from the agricultural farms in the highlands of Chattogram are the biggest contributors of heavy metals in the water. Since the heavy metals in the environment have continued to increase, there is need to determine their levels in the environment for efficient environment management and hence the need to determine the levels of heavy metals in the water of the Karnaphuli River, Chattogram. In the present study, the heavy metals that were analyzed included Pb, Cr and Ni. There are 10 water samples were collected from different industrial, non-industrial, residential and commercial sites of the Karnaphuli River at dry seasonal period. The collected water samples were immediately preserved at 3° to 4°C and digested using nitric acid and hydrochloric acid. The digested water samples were analyzed for heavy metals using Atomic Absorption Spectrophotometer (AAS). The data was analyzed using ANOVA with the level of significance ( $\leq 0.05$ ). From the findings, means of Pb were found below detection limit (BDL) in several points like Patenga sea beach, Shipping Corporation, Chaktai New Bridge, Lamburhat and Rangunai sadar. Within the detection limit the mean concentration of Pb  $0.0455\pm 0.00015$ ,  $0.131\pm 0.0014$ ,  $0.0152\pm 0.00015$ ,  $0.0172\pm 0.00014$ ,  $0.072\pm 0.0014$  mg/L were found in the 15 no. ghat (opposite of KAFCO), Sadarghat jetty, Banglabazar ghat, Firingibazar ghat, Kalurghat industrial areas respectively. The mean levels of Cr were found BDL in the Patenga sea beach, Lamburhat and Rangunai sadar. Within the detection level, concentration of Cr  $0.0264\pm 0.00015$ ,  $0.0123\pm 0.00015$ ,  $0.115\pm 0.00212$ ,  $0.0091\pm 0.0003$ ,  $0.024\pm 0.0015$ ,  $0.0186\pm 0.00014$ ,  $0.092\pm 0.0014$  mg/L were found in the 15 no. ghat, Sadarghat jetty, Banglabazar ghat, Firingibazar ghat, Kalurghat industrial areas respectively. The means of Ni were found BDL in Patenga sea beach, the 15 no. ghat, Shipping Corporation, Lamburhat and Rangunai sadar. While the mean levels of Ni  $0.012\pm 0.003$ ,  $0.0072\pm 0.00015$ ,  $0.012\pm 0.0015$ ,  $0.016\pm 0.0015$ ,  $0.050\pm 0.0014$  mg/L were found in Sadarghat jetty, Banglabazar ghat, Firingibazar ghat, Kalurghat industrial areas respectively. Ni was found below the permissible limit of WHO standard of drinking water (0.07 mg/L) in all stations during the analysis. However, the highest content of Pb and Cr were found in Sadarghat jetty are  $0.131\pm 0.0014$  and  $0.115\pm 0.00212$  mg/L respectively which exceeds the permissible limits of WHO standards (WHO, 1993, 2004 and 2011). This study will convey a strong message for the government body, policy maker and local authority to establish rules and regulation for frequent monitoring of heavy metals in this environment and hence providing a guideline to curb heavy metal pollution in water of the Karnaphuli River including other important rivers in Bangladesh.

**Key words:** Water, Heavy metal, Atomic Absorption Spectrophotometer, Pollution, Lead, Chromium, Nickel, Karnaphuli River.