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International Journal of Sciences: Basic and Applied Research (IJSBAR)

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The [International Journal of Sciences: Basic and Applied Research \(IJSBAR\)](#) is an open access International Journal for scientists and researchers to publish their scientific papers in [all main branches of science \(All scientific disciplines\) such as Social Sciences, Natural Sciences, Formal Sciences, and Applied science](#). International availability for author's scientific Papers can be achieved by [Indexing, Abstracting, and Listing](#) their papers. The International Journal of Sciences: Basic and Applied Research ([IJSBAR](#)) is serving as a new online journal medium for the international scientific community and research centers.

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Mission & Vision

Vision

Excellence in publishing quality scientific research papers and leadership at the international level.

Mission

The [IJSBAR](#) journal is keen to be a center for publishing and promoting knowledge and scientific research at the international level.

Focus and Scope

The International Journal of Sciences: Basic and Applied Research ([IJSBAR](#)) intended to publish original research papers not previously published, that is not being considered elsewhere for publication in [all main branches of science \(All scientific disciplines\)](#).

Indexing and Abstracting

[Click to find the Indexing and Abstracting for the journal.](#)

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The [IJSBAR](#) Journal have two peer review options:

1. Ordinary peer review process: Excepted time is between 14 - 21 days. (The cost 105 USD).
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To submit paper to [IJSBAR](#) journal; Authors should register themselves as authors using [IJSBAR](#) open journal system ([IJSBAR](#) OJS) using the following [registration page](#). For already registered users; they should [login to the journal](#) and begin the five-step process to submit their papers. Authors can send the paper directly by email using editorijsbar2@gssrr.org

Registration Note:

- Please add the email address editorijsbar2@gssrr.org in your Email address book so that the messages from Editorial Office do not end up in your spam without you knowing it.

Manuscript Structure:

- Submitted manuscripts to the journal should use the following template ([download the template](#)).
- The manuscript should be in English.
- The manuscript should be arranged as follows:

1- *Title page*. This should contain:

- a concise and informative title (as short as possible).
- a list of authors' names.

2- *Abstract*: the abstract should convey the following information:

- The purpose of the project .
- The research problem.
- The methods used to address this research problem.
- The conclusions reached.
- The significance of the research project.

3- *Key-words*. A list in alphabetical order not exceeding 8 words or short phrases.

4- *Introduction*: The function of the Introduction is to:

- This is accomplished by discussing the relevant primary research literature (with citations) and summarizing our current understanding of the problem you are investigating;
- State the purpose of the work in the form of the hypothesis, question, or problem.
- Briefly explain your approach in solving the problem of the research.

5- *Materials and methods*: you explain *clearly* how you carried out your study.

6- *Results*: State the results and draw attention to important details.

7- *Discussion*: Point out the significance of the results in relation to the reasons for doing the work.

8- *Conclusion*: state the implications of the answers your results gave you.

8- *Citations and References*: this journal uses the IEEE Citation Style. ([download detailed instructions](#))

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Author Downloads

Authors can download the following files:

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Corrections to the published papers are possible under the certain circumstances. In very rare circumstances, the [IJSBAR](#) also reserves the right to remove articles, kindly read the following

details:

1. Errata

Errata concern the amendment of mistakes introduced by the journal in editing or production, including errors of omission such as failure to make factual proof corrections requested by authors within the deadline provided by the journal and within journal policy. Errata are generally not published for simple, obvious typing errors, but are published when an apparently simple error is significant (for example, a greek mu for an 'm' in a unit, or a typing error in the corresponding author's email address). If there is an error in a figure or table, the usual procedure is to publish a sentence of rectification. A significant error in the figure or table is corrected by publication of a new corrected figure or table as an erratum. The figure or table is republished only if the editor considers it necessary. If the colors of histogram bars were wrongly designated in the figure legend, for example, a sentence of correction would be published as an erratum; the entire figure would not be reproduced.

2. Corrigendum

A Corrigendum notifies readers that an article has been corrected subsequent to publication. It is issued by the Publisher and is used in cases where typographical or production errors (either the fault of the authors or the publisher) affect the integrity of the article metadata (such as title, author list or byline) or will significantly impact the readers' ability to comprehend the article. The original article is removed and replaced with a corrected version and a Corrigendum describing the correction is linked to it. The date the correction is made is noted on the corrected article. Corrigenda are freely available to all readers.

3. Retractions

Articles may be retracted or withdrawn by their authors, academic or institutional sponsor, editor or publisher, because of pervasive error or unsubstantiated or irreproducible data. For example, an article's conclusions may have been based upon faulty logic or computation, its data may have been obtained by accident from a contaminated cell line or through poor instrumentation, or it may have been derived from falsified or fabricated data. [IJSBAR](#) does not differentiate between articles that are retracted because of honest error and those that are retracted because of scientific misconduct or plagiarism. If the notification in the journal is labeled as a retraction or withdrawal, [IJSBAR](#) will index it as a retraction.

4. Article removal

In very rare circumstances it may be necessary to remove an article from the online journal. This will only occur where the article is clearly defamatory, or infringes others' legal rights, or where the article is, or there is good reason to expect it will be, the subject of a court order, or where the article, if acted upon, might pose a serious health risk. In these circumstances, while the

bibliographic information (title and authors) will be retained online, the text will be replaced with a page indicating that the article has been removed for legal reasons.

5. Duplicate Publication

[IJSBAR](#) identifies an article that substantially duplicates another article without acknowledgement by assigning both articles. Such articles have one or more authors in common and a substantial amount of duplicated text. [IJSBAR](#) does not routinely examine articles for originality.

Note: Kindly contact the editor if you need any changes regarding your paper editorijsbar2@gssrr.org

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Conflict of interest Policy (COIP)

Conflict of interest (COI) exists when there is a divergence between an individual's private interests (competing interests) and his or her responsibilities to scientific and publishing activities such that a reasonable observer might wonder if the individual's behavior or judgment was motivated by considerations of his or her competing interests.

TYPES OF COMPETING INTERESTS

1- Financial ties.

2- Academic commitments. Participants in the publications process may have strong beliefs ("intellectual passion") that commit them to a particular explanation, method, or idea. They may, as a result, be biased in conducting research that tests the commitment or in reviewing the work of others that is in favor or at odds with their beliefs.

3- Personal relationships.

4- Political or religious beliefs. Strong commitment to a particular political view (e.g., political position, agenda, or party) or having a strong religious conviction may pose a COI for a given publication if those political or religious issues are affirmed or challenged in the publication.

5- Institutional affiliations. A COI exists when a participant in the publication process is directly affiliated with an institution that on the face of it may have a position or an interest in a publication.

DECLARING AND MANAGING COIs

All declarations about COI should be requested in writing as a condition of reviewing a manuscript and asked in such a way that authors will have a high likelihood of reporting their COIs related to the manuscript.

The consequences for failing to declare COI.

Any COI will be treated based on flowcharts for the Committee on Publication Ethics (COPE); those charts that can be downloaded from the following link (<http://publicationethics.org/resources/flowcharts>).

Which COIs will result in a manuscript not being considered further?

All types of COI mentioned in the previous text will result in stop processing and rejecting the manuscript until the COI is solved.

RESPONSIBILITIES OF PARTICIPANTS

Authors:

All authors should report any COI related to their research to the editor.

Reviewers:

All reviewers should report any COI related to their reviewing tasks to the editor.

Editors:

Editors should not make any editorial decisions or be involved in the editorial process if they have or a close family member has a COI (financial or otherwise) in a particular manuscript submitted to their journal.

Peer Review Process

This journal uses double-blind review, which means that both the reviewer and author identities are concealed from the reviewers, and vice versa, throughout the review process. To facilitate this, authors need to ensure that their manuscripts are prepared in a way that does not give away their identity.

The Editor In Chief will send the paper for peer review to two reviewers, if the results were negative by one reviewer and positive by the other one; then the editor may send the paper for third reviewer or he take immediately the final decision by accepting\rejecting the paper. The Editor In Chief will ask the selected reviewers to present the results within 7 working days, if they were unable to complete the review within the agreed period then the editor have the right to resend the papers for new reviewers using the same procedure.

All research papers publications in the International Journal of Sciences: Basic and Applied Research ([IJSBAR](#)) undergo full peer review, each submitted manuscript is evaluated on the following basis:

- The originality of its contribution to the field of scholarly publishing.
 - The soundness of its theory and methodology given the topic.
 - The coherence of its analysis.
 - The ability to communicate to readers(grammar and style).
 - All research papers are reviewed by at least two suitably qualified experts.
 - All publication decisions are made by the journals' Editor on the basis of the reviews provided.
 - Members of the international Editorial Boards lend insight, advice and guidance to the Editor generally and to assist decision making on specific submissions.
 - Normal turn-around time for evaluation of manuscripts is 21 days from the date of recipient.
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Publication Frequency

12 volumes per year. Individual items (the author accepted paper) can be published by The [International Journal of Sciences: Basic and Applied Research \(IJSBAR\)](#) as soon as they are ready, the author paper will be published immediately after its acceptance (usually less than 21 days), our online publishing system will be able to add it to the "current" volume's Table of Contents.

Publication Ethics and Publication Malpractice Policy

- This Journal apply COPE principles of publication ethics outlined in the [COPE's guidelines](#) and [core practices](#).

Duties of Editors

Publication decisions

The editor of International Journal of Sciences: Basic and Applied Research ([IJSBAR](#)) is responsible for deciding which of the articles submitted to the journal should be published. The editor may be guided by the policies of the journal's editorial board and constrained by such legal requirements as shall then be in force regarding libel, copyright infringement and plagiarism. The editor may confer with other editors or reviewers in making this decision.

Fair play

An editor should evaluate manuscripts for their intellectual content without regard to race, gender, sexual orientation, religious belief, ethnic origin, citizenship, or political philosophy of the authors.

Confidentiality

The editor and any editorial staff must not disclose any information about a submitted manuscript to anyone other than the corresponding author, reviewers, potential reviewers, other editorial advisers, and the publisher, as appropriate.

Disclosure and conflicts of interest

Unpublished materials disclosed in a submitted manuscript must not be used in an editor's own research without the express written consent of the author.

Duties of Reviewers

Contribution to Editorial Decisions

Peer review assists the editor in making editorial decisions and through the editorial communications with the author may also assist the author in improving the paper.

Promptness

Any selected referee who feels unqualified to review the research reported in a manuscript or knows that its prompt review will be impossible should notify the editor and excuse himself from the review process.

Confidentiality

Any manuscripts received for review must be treated as confidential documents. They must not be shown to or discussed with others except as authorized by the editor.

Standards of Objectivity

Reviews should be conducted objectively. Personal criticism of the author is inappropriate. Referees should express their views clearly with supporting arguments.

Acknowledgement of Sources

Reviewers should identify relevant published work that has not been cited by the authors. Any statement that an observation, derivation, or argument had been previously reported should be accompanied by the relevant citation. A reviewer should also call to the editor's attention any substantial similarity or overlap between the manuscript under consideration and any other published paper of which they have personal knowledge.

Disclosure and Conflict of Interest

Privileged information or ideas obtained through peer review must be kept confidential and not used for personal advantage. Reviewers should not consider manuscripts in which they have conflicts of interest resulting from competitive, collaborative, or other relationships or connections with any of the authors, companies, or institutions connected to the papers.

Duties of Authors

Reporting standards

Authors of reports of original research should present an accurate account of the work performed as well as an objective discussion of its significance. Underlying data should be represented accurately in the paper. A paper should contain sufficient detail and references to permit others to replicate the work. Fraudulent or knowingly inaccurate statements constitute unethical behavior and are unacceptable.

Data Access and Retention

Authors are asked to provide the raw data in connection with a paper for editorial review, and should be prepared to provide public access to such data and should in any event be prepared to retain such data for a reasonable time after publication.

Originality and Plagiarism

Authors should ensure that submitted work is original and has not been published elsewhere in any language, and if the authors have used the work and/or words of others that this has been appropriately cited or quoted.

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An author should not in general publish manuscripts describing essentially the same research in more than one journal or primary publication. Submitting the same manuscript to more than one journal concurrently constitutes unethical publishing behavior and is unacceptable.

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Proper acknowledgment of the work of others must always be given. Authors should cite publications that have been influential in determining the nature of the reported work.

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Authorship should be limited to those who have made a significant contribution to the conception, design, execution, or interpretation of the reported study. All those who have made significant contributions should be listed as co-authors. Where there are others who have participated in certain substantive aspects of the research project, they should be acknowledged or listed as contributors.

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All authors should disclose in their manuscript any financial or other substantive conflict of interest that might be construed to influence the results or interpretation of their manuscript. All sources of financial support for the project should be disclosed.

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When an author discovers a significant error or inaccuracy in his/her own published work, it is the author's obligation to promptly notify the journal editor or publisher and cooperate with the editor to retract or correct the paper.

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Process for identification of and dealing with allegations of research misconduct

The International Journal of Sciences: Basic and Applied Research ([IJSBAR](#)), and the editors are committed to take reasonable steps to identify and prevent the publication of papers where research misconduct has occurred, including plagiarism, citation manipulation, and data falsification/fabrication, among others. The journal or its editors will not encourage such misconduct under any circumstances, or knowingly allow such misconduct to take place. In the event that the [IJSBAR](#) or the editors are made aware of any allegation of research misconduct relating to a published article in this journal – we shall follow [COPE's guidelines](#) in dealing with allegations.

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We welcome any note provided by readers and authors to improve this journal. The journal will strive to satisfy the requirements of the following organizations:

1- Committee on Publication Ethics (COPE, <https://publicationethics.org>)

- COPE provides advice to editors and publishers on all aspects of publication ethics and, in particular, how to handle cases of research and publication misconduct. in this journal; we apply COPE principles of publication ethics outlined in the [core practices](#) also [[Available to download as an A4 poster.](#)]

2- The Open Access Scholarly Publishers Association (OASPA, <https://oaspa.org>)

- OASPA is a trade association that was established in 2008 in order to represent the interests of Open Access (OA) publishers globally across all disciplines.
- OASPA is encouraging collaboration in developing appropriate business models, tools and standards to support OA publishing, OASPA aims to help ensure a prosperous and sustainable future for the benefit of its members and the scholarly communities they serve. This mission is carried out through exchanging information, setting standards, advancing models, advocacy, education, and the promotion of innovation.

3- World Association of Medical Editors (WAME, <http://www.wame.org>)

- WAME is a global nonprofit voluntary association of editors of peer-reviewed medical journals who seek to foster cooperation and communication among editors; improve editorial standards; promote professionalism in medical editing through education, self-criticism, and self-regulation; and encourage research on the principles and practice of medical editing. WAME develops policies and recommendations of best practices for medical journal editors and has a syllabus for editors that members are encouraged to follow.

Focus and Scope

Journal's scope includes:

[International Journal of Sciences: Basic and Applied Research \(IJSBAR\)](#) is the International Scientific Research Journal that is intended to publish original research in all main branches of science (scientific disciplines) such as Social Sciences , Natural Sciences , Formal Sciences, and Applied science. The [IJSBAR](#) accept submissions in the following areas: (but not limited)

anthropology, archaeology, communication, criminology, education, government, linguistics, international relations, political science, sociology, Earth science, Ecology, Oceanography, Meteorology, Life science, Human biology, Decision theory, Logic, Mathematics, Statistics, Systems theory, Theoretical computer science, Applied physics, Computer science, all Fields of engineering, Accounting, , Education, Economics, Medical Technology, Biology, Medicine, Management, History,

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Prof. Dr. Indrani Pramod Kelkar, Department of Mathematics, Chief Mentor, Acharya Institute of Technology, Soldevanahalli, Hesaraghatta Main Road, Banavara Post, Bangalore- 560 107. Cell : 9164685067, India

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Dr. Nimish H. Vasoya, Head - General Department SANJAYBHAI RAJGURU COLLEGE OF ENGINEERING (Previously Om Shanti Engineering College), Sanjaybhai Rajguru Education Zone, At-Hadmatia (Bedi), Morvi Road, Rajkot- 360 003, India

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Email: editorijsbar2@gssrr.org P.O.Box: 255, Postal Code: 11941 Amman, Jordan. Phone: 00962789994246 Ext: 27 Office Hours: 24 hours

Principal Contact

Dr. Mohammad Nasar
Editor In Chief
International Scientific Research and Researchers Association (ISRRA)

Phone
Phone: 00962788780593

editorijsbar2@gssrr.org

Support Contact

Rabindra Corat Kayastha
Phone
00962789994246 Ext: 27

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Mapping of Health Disorders Related to Mercury on Community around the Bone River, Gorontalo Province

Sri Manovita Pateda

Public Health Department, Sport and Health Faculty, State University of Gorontalo

Yayu Indriati Arifin

Geology Department, Mathematics, Physics and Science Faculty, State University of Gorontalo

Vivien Novarina Kasim

Nursing Department, Sport and Health Faculty, State University of Gorontalo

Keywords: Health Disorder, Mercury, ataxia symptoms, and dysarthria.

Abstract

Health problems associated with mercury depend on the amount of Hg levels that enter the body and accumulate in it. Symptoms that arise from the mildest of paresthesia to more severe symptoms of ataxia, dysarthria can even cause death. This study aims to map health-related health problems of mercury in the Bone River, Gorontalo Province. The Bone River is a river in Gorontalo Province has been polluted by heavy metals mercury due to traditional mining activities that dispose of the mercury-containing mining process to the river water. The health disorders described from the mapping, indicating that the tremor neurological disorder is most significant, especially at sample point V (closest to the mining) with a positive sample percentage of 28.6%. This concludes that prominent symptoms in humans associated with mercury are neurologic symptoms, especially tremor (through nasal examination). Other symptoms are not specific. Further research is needed to conduct a deeper assessment of health problems in the community, especially associated with neurobehavior and neurocognition, both in adults and in children.

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Mapping of Health Disorders Related to Mercury on Community around the Bone River, Gorontalo Province

Sri Manovita Pateda^{a*}, Yuyu Indriati Arifin^b, Vivien Novarina Kasim^c

^a*Public Health Department, Sport and Health Faculty, State University of Gorontalo*

^b*Geology Department, Mathematics, Physics and Science Faculty, State University of Gorontalo*

^c*Nursing Department, Sport and Health Faculty, State University of Gorontalo*

^a*Email: manovita.pateda@gmail.com*

Abstract

Health problems associated with mercury depend on the amount of Hg levels that enter the body and accumulate in it. Symptoms that arise from the mildest of paresthesia to more severe symptoms of ataxia, dysarthria can even cause death. This study aims to map health-related health problems of mercury in the Bone River, Gorontalo Province. The Bone River is a river in Gorontalo Province has been polluted by heavy metals mercury due to traditional mining activities that dispose of the mercury-containing mining process to the river water. The health disorders described from the mapping, indicating that the tremor neurological disorder is most significant, especially at sample point V (closest to the mining) with a positive sample percentage of 28.6%. This concludes that prominent symptoms in humans associated with mercury are neurologic symptoms, especially tremor (through nasal examination). Other symptoms are not specific. Further research is needed to conduct a deeper assessment of health problems in the community, especially associated with neurobehavior and neurocognition, both in adults and in children.

Keywords: Health Disorder; Mercury; ataxia symptoms; and dysarthria.

* Corresponding author.

1. Introduction

The human body has a homeostatic ability to maintain a stable state of the body, as well as in controlling heavy metals. However, when excessive concentrations of heavy metals, both acute and chronic, it will give the effect of poisoning the body, which will automatically affect the disruption of homeostasis of the body. One of the heavy metal into current national and international issues as well as widely studied is the impact of heavy metal pollution of mercury (Hg). In addition to harming the environment and ecosystems in general, mercury greatly affects the level of morbidity and mortality in humans. Chronic effects arising from mercury poisoning was more frightening than the acute effects that occur [1-3].

Mercury that contaminates the environment, it can accumulate in the food which is the source for human consumption. Vegetables and fruits are grown in an environment that has been contaminated by mercury, or meat from livestock that eat grass and also contain mercury, when consumed by humans are very dangerous for human health. Health problems that arise depend on the amount of Hg levels that enter the body and accumulate in it. Symptoms that arise from the mildest of paresthesia to more severe symptoms of ataxia, dysarthria can even cause death. Babies born to mothers who consume mercury-containing foods (in the form of methyl mercury) when prenatal will experience abnormalities of cerebral palsy or mental retardation [4, 5].

The Bone River as one of the rivers in Gorontalo Province, located in two regions, Bone Bolango and Gorontalo, became the river with the greatest threat contaminated by mercury. The 2007 Gorontalo Provincial Environmental Research, Information and Technology Research Report states that mercury (Hg) levels in the Bone River are 0.022 mg / l (normally <0.002 mg / l). Research mercury content at the mouth of the Bone River has exceeded the allowed threshold of 0.01489 mg / l (at low tide at the bottom of the river).

The main cause by the existence of traditional gold mining as a producer of mercury waste discharged into the flow of the River Bone. This mining activity has existed even before Indonesia's independence, so that the feared toxicity process has occurred chronically to people using the Bone River water source should be a serious concern.

Therefore, this study aims to identify the health problems occurring in communities surrounding the Bone River related to mercury contamination and analyze the health problems that have occurred in terms of biomedical and community characteristics around the Bone River Gorontalo Province, and mapped spatially using a mapping system based GIS [6].

2. Material And Methods

2.1 Examination of Mercury

Based on data from the Gorontalo Provincial Environment and Research Agency of 2016, the existing gold mining activities in the Province of Gorontalo are indicated to have a negative impact on the quality of river water in Gorontalo Province.

The results of monitoring the status of Bone River water quality [7], ie on the upstream, middle, and downstream are on the status of black pollen.

2.2 Examination of Public Health Problems

a. Determination of research subjects

This study aims to assess the health effects associated with mercury on the people who live around the river Bone, Gorontalo province. The determination of the community to be the research sample is determined by the proximity of the residence with the Bone River.

Proximity is meant here is the people who live within a radius of 1 kilometer from the mouth of the river, so that all the houses that are within that radius will be the study population.

b. Data retrieval

Research data collected in some time at 5 points of sampling by using accidental sampling method, that is:

- The sample point I in Sukma Village, Botupingge District, Bone Bolango Regency, on May 19th, 2017, total sampleare 49 people.
- The sample point II in Panggulo Village, Botupingge District, Bone Bolango Regency, on May 20th, 2017, total sampleare 18 people.
- The sample point III in Dutohe Village, Kabila District, Bone Bolango Regency, on May 21st, 2017, total sampleare 24 people.
- The sample point IV in Lombongo Village, Suwawa District, Bone Bolango Regency, on June 15, 2017, total sampleare 19 people.
- The sample point V in Tulabolo Village, East Suwawa District, Bone Bolango Regency, on July 10th, 2017, total sampleare 28 people.

The total sample is 138 people.

Health data were taken using the standard "Protocols for Environmental and Health Assessment of Mercury Released by Artisanal and Small-Scale Gold Miners" issued by "the United Nations Industrial Development Organization (UNIDO)" modified adjusted to the examination requirements to be achieved.

2.3 Statistical Analysis and Mapping

Data processing uses a computerized statistical system and mapping using a GIS-based mapping system.

3. Results

3.1 General Data

Distribution of characteristic of research sample is viewed from general data that is gender, age and residence

based on sample point can be seen in table 1.

Table 1: Distribution of sample characteristics by sex, age and sample point

No	Characteristics	n	%
I	Sex		
–	Male	39	28,3
–	Female	99	71,7
II	Age		
–	< 15 years	2	1,4
–	16 – 30 years	18	13,0
–	31 – 45 years	50	36,2
–	46 – 60 years	46	33,3
–	61 – 75 years	20	14,5
–	> 75 years	2	1,4
	Mean : 46,1 years		
III	Sample Point		
–	The sample point I	49	35,5
–	The sample point II	18	13,0
–	The sample point III	24	17,4
–	The sample point IV	19	13,8
–	The sample point V	28	20,3

Source: Primary data, 2017

Characteristic of sample in this research indicate that most of sample is woman with percentage 71,7%. The average age of the sample was 46.1 years with the greatest number are in the age range 31-45 years (36.2%).

The highest sampling was obtained from point I of 49 people (35.5%) because in this area is quite densely populated. The distribution of the number of samples in the mapping based on the collection point can be seen in figure 1.

3.2 Correlation With Mercury

In sampling interviews, the question of mercury linkage includes three questions: (1) proximity to residence with mining areas, (2) work experience in mining areas, and (3) employment history as miners. The connection

with mining is shown in figure 2, where sample point V is the area closest to the mine located in Tulabolo Timur Village, East Suwawa District, Bone Bolango Regency. Frequency of association with mercury can be seen in table 2.

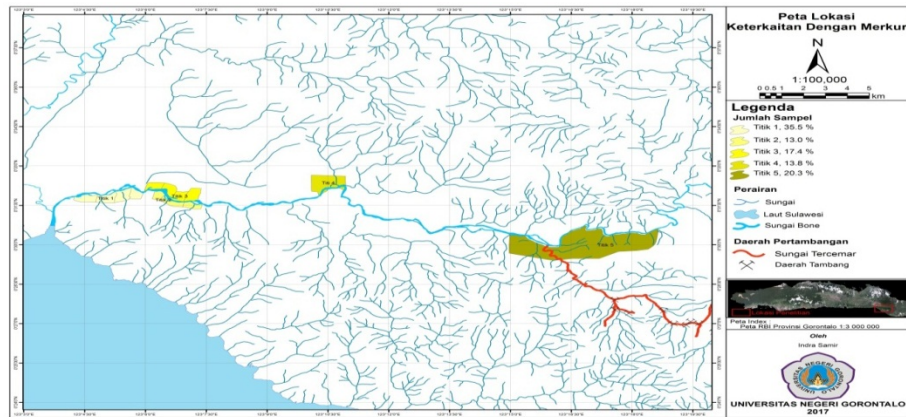


Figure 1: Mapping the distribution of the number of samples based on the collection point(https://drive.google.com/file/d/0B_H28R6ryXJ6b2MySjdCdTNNakE/view)

Table 2: Distribution of Relationship with Mercury

No	Relationship with Mercury	n	%
1	Yes	25	18,1
2	No	113	81,9
TOTAL		138	100

Source: Primary data, 2017

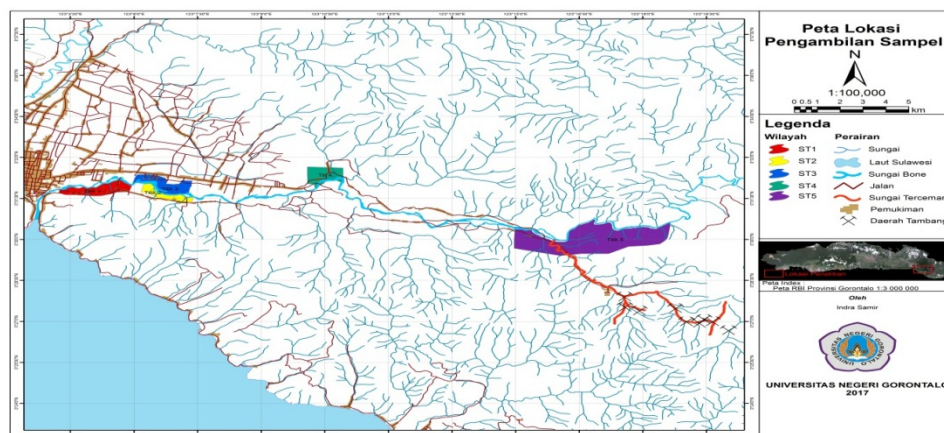


Figure 2: Mapping of sample point location based on proximity to mining area(https://drive.google.com/file/d/0B_H28R6ryXJ6WHZPN1BFbWtCVUE/view)

The presence or absence of mercury-linkage per sample research point, shown by graph 1. The graph explains that the closer to the mine (sample point V), the higher the mercury linkage (18 samples from 28 samples).

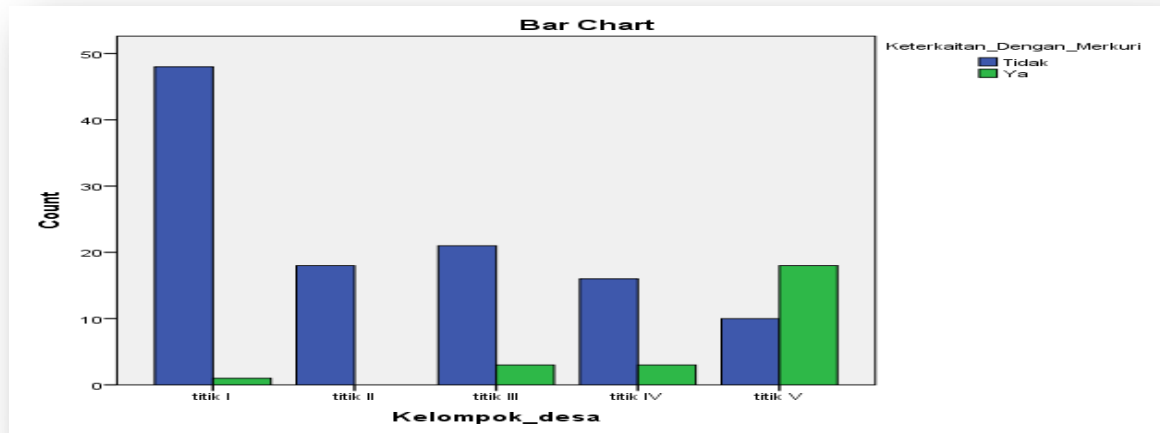


Figure 5: Distribution of mercury linkages at 5 sample points of the study

3.3 Anamnesis

Medical examination with anamnesis of symptoms of perceived health disturbance was done by giving 20 question to sample, but there are 2 very significant question in this research that is question about symptoms of headache and symptoms of numbness, cramping and pain (perioral disesthesia or glove and stocking type). The description of the distribution of headache complaints can be seen in table 3.

Table 3: Distribution of headache complaints

Criteria	Not frequent headaches	Frequent headaches	Total
Frequency			
– Quantity	84	54	138
– Percentage	60,9 %	39,1 %	100 %
Sample Point			
– The sample point I	59,2 %	40,8 %	100 %
– The sample point II	16,7 %	83,3 %	100 %
– The sample point III	83,3 %	16,7 %	100 %
– The sample point IV	73,7 %	26,3 %	100 %
– The sample point V	64,3 %	35,7 %	100 %

Source: Primary data, 2017

Table 3 shows that the highest headache complaints are at sample point II and the lowest at sample point III, and the frequency of headache most of the sample did not feel the complaint.

Symptoms of numbness, cramps and pain (perioral disesthesia or glove and stocking type) also provide results that are pretty much complained about. The distribution of these complaints can be seen in graph 2. It appears that in all sample points, these symptoms are symptoms that are often complained of by most samples.

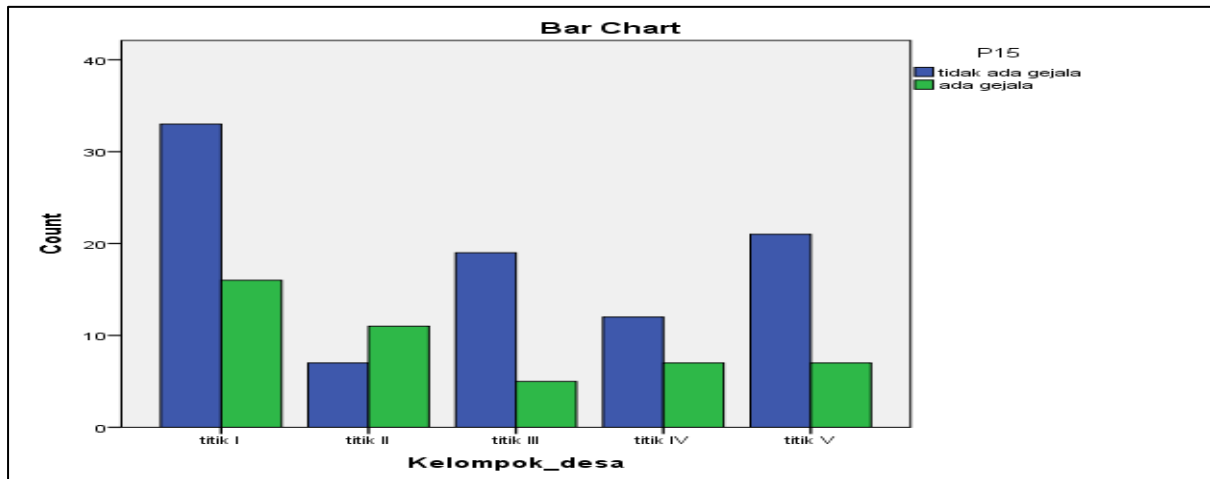


Figure 6: Distribution of atrophy, cramping and pain (perioral disesthesia or glove and stocking type) at 5 sample points (Source: Primary Data, 2017)

3.4 Clinical Neurological Assessment

Clinical Neurological Assessment focuses on the emergence of signs of changes in eye conditions, where the appearance of blue circles on the outside of the iris and presence of Kayser Fleischer signs, and the presence of symptoms of tremor in the test of finger to nose. Table 4 illustrates the presence or absence of eye disorders according to the sample point and table 5 shows the distribution of tremor symptoms based on the results of finger to nose test per sample point.

Table 4: Distribution of eye disorders according to the sample point

Sample Point	Disturbance (%)	No Disturbance (%)	Total
I	8,1%	91,8 %	100 %
II	27,8 %	72,2 %	100 %
III	8,3 %	91,7 %	100 %
IV	21,1 %	78,9 %	100 %
V	35,7 %	64,3%	100 %

Source: Primary data, 2017

The disturbed eye condition is most prevalent at the sample point V (35.7%) which is an area close enough to the mining area (Tulabolo Village). Mapping of eye conditions can be seen in figure 3. It is seen from Figure 3 that the disruption in the eye is higher in the sample point V area, and further away from the mining area, the less eye condition is reduced.

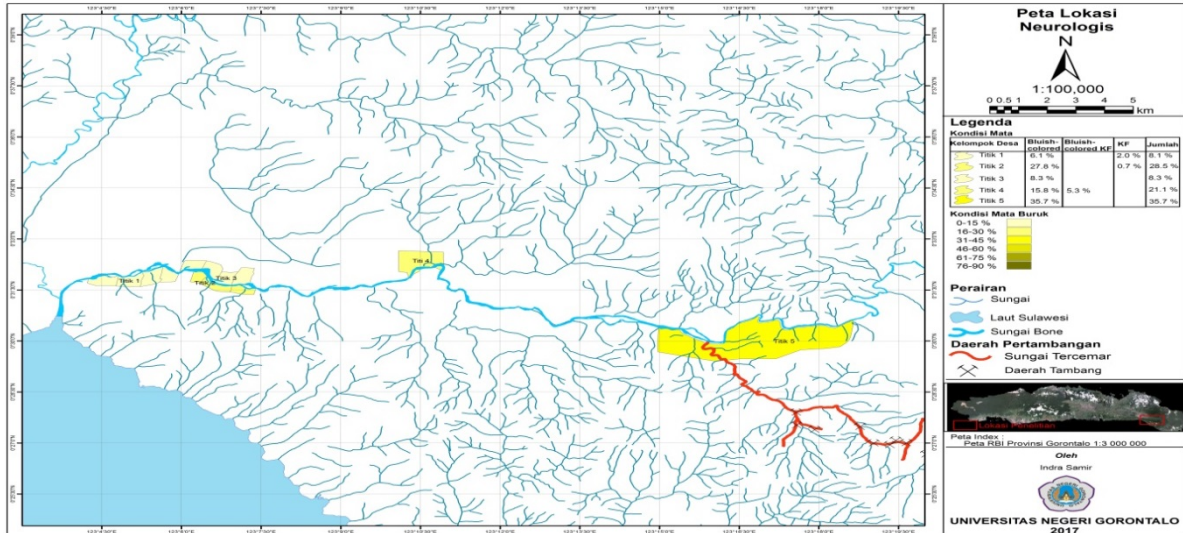


Figure 3: Mapping of eye conditions based on the sample point. (https://drive.google.com/file/d/0B_H28R6ryXJ6X0hrTIZ3WUY2NEE/view)

Table 5 shows that the symptoms of tremor shown by the sample through nasal examination were highest, there was a sample point IV (mild symptoms + weight = 15.8%) and sample point V (mild symptoms + weight = 28.6%).

Table 5: Distribution of samples based on the level of symptoms of tremor through the results of examination of the finger to nose test per sample point.

Sample Point	Tremor (%)			Total
	No symptom	Mild	Heavy	
I	87,8 %	12,2 %	0 %	100 %
II	72,2 %	11,1 %	16,7 %	100 %
III	100 %	0 %	0 %	100 %
IV	84,2 %	5,3 %	10,5 %	100 %
V	71,4 %	25,0 %	3,6 %	100 %
TOTAL	84,1 %	11,6 %	4,3 %	100 %

Source: Primary data, 2017

The sample point IV (Lombongo Village) and the sample point V (Tulabolo Village) are fairly close to the mining area. The mapping in figure 4 can illustrate the severity of the tremor symptoms per sample point. The older the purple color the higher the percentage of samples who experience symptoms of tremor based on neurological examination of the finger to nose test.

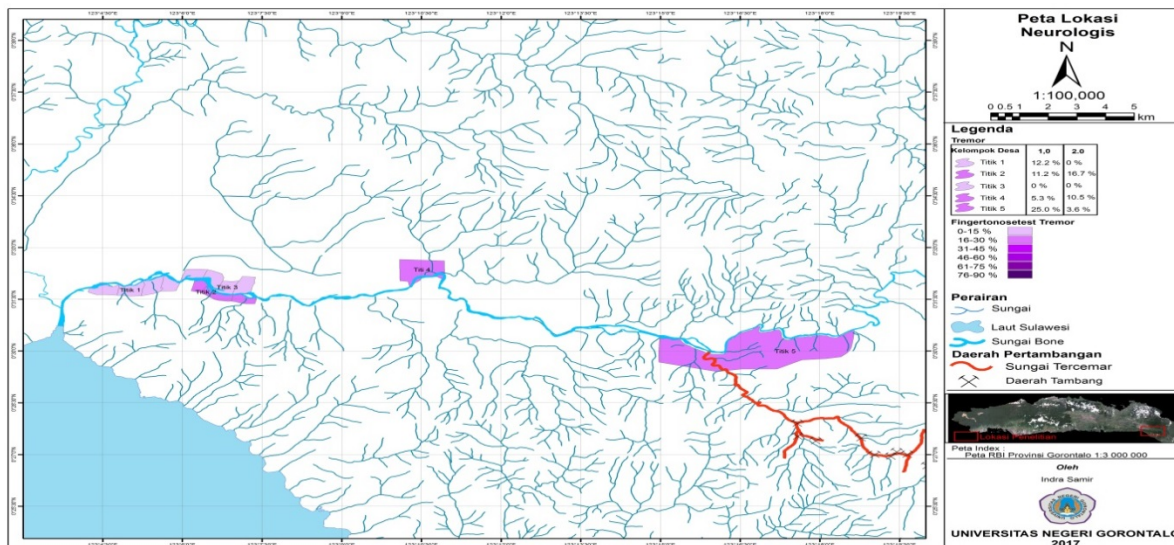


Figure 4: Mapping of symptoms of tremor symptoms per sample point. (https://drive.google.com/file/d/0B_H28R6ryXJ6WGh3cGZiYmFJWG8/view)

4. Discussion

Mercury is one of the chemical elements that are often used in the process of separation of gold with other metal elements follow. Mercury is a dangerous heavy metal, which in any small concentration can be toxic. Mercury and mercury compounds have very high toxicity, because they are highly reactive and are biologically active molecules, causing disruption of living things. The wider impact occurs when mercury has polluted the environment, because mercury will spread rapidly because of its very high mobility and can be concentrated through the food chain [8].

Humans as part of the food chain will not escape the impact of environmental pollution caused by mercury. The mercury pollution effect on human health is obtained because people consume food, even meat from livestock that consume plants that have been contaminated with mercury. The process of the occurrence of disease in humans is usually chronic, due to the length of the latent period from exposure to the onset of symptoms [9, 10].

The results of this study generally indicate that the health checks performed have shown symptoms of a disturbance caused by mercury. A very obvious health disorder is a neurological disorder which, as in this study, is a disorder of the eyes in the form of a blue circle on the iris and Kayser Fleischer sign, as well as the onset of tremors on the finger to nose test [11].

The effect of mercury toxicity on humans depends on the form of mercury composition, its entry into the body,

and its duration of development. An example is the mercury (HgCl_2) more toxic than mercurio (HgCl). This is because the divalent form is more soluble than the monovalent form. In addition, the form of HgCl_2 is also fast and easily absorbed so that its higher toxicity [2].

Organic forms such as methyl mercury, about 90% are absorbed by the intestinal wall, this is much larger than the inorganic form (HgCl_2) which is only about 10%. However, this inorganic mercury form is less corrosive than the organic form. The organic form can also penetrate the blood barrier and placenta so it can cause teratogenic effects and neurological disorders [5]. The toxicity of mercury in humans is distinguished according to the form of Hg compounds, namely inorganic and organic. Hg inorganic poisoning has been known since the 18th and 19th centuries with thermic symptoms in adults. Symptoms of tremor have been known since the 18th century called "hatter's shakes" (hats shake), because at that time many workers in hat and wool factories suffer from these symptoms. Symptoms persist with tremors of the facial muscles, which then propagate to the fingers and hands. When the poisoning continues, tremors occur on the tongue, speaking haltingly, walking looks stiff, and loss of balance [2, 12, 14]. The research conducted by Arifin, Sakakibara and Sera in the journal geosciences (2015) states that the apparent neurological disorder of gold miners in Gorontalo Utara is generally a tremor (27%).

5. Conclusion

The conclusion that can be drawn from this study is that the major health disorders that appear associated with mercury pollution are neurological disorders, and tremor is the most common symptom. Further research is needed to conduct a deeper assessment of health problems in the community, particularly in relation to neurobehavior and neurocognition, both in adults and in children.

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