Assessment of knowledge levels and attitudes of Artisanal Gold Miners towards chemical contamination in the Mhondoro-Ngezi District, Zimbabwe

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Abstract

While a number of studies have been undertaken on the dangers of artisanal gold mining in Zimbabwe, very few of them have addressed the reasons why the practice has continued despite the associated health risks. The purpose of this study, therefore, was to assess the miners’ knowledge and attitudes towards the health risks emanating from the use of chemicals in their mining operations in the Mhondoro-Ngezi District. The study used the qualitative design and collected data from 47 artisanal gold miners through questionnaires, interviews and observations. Data were presented using tables, pie charts and graphs. The study confirmed the existence of health risks among the miners. These included chemical contamination, skin irritations, tuberculosis, cancer, damages to vision, and intestinal diseases. The study further established that the majority of the miners were aware of the health risks of their trade but continued to endanger their lives due to the following factors that prevailed in their district and the country at large: widespread unemployment; unreliable farming due to the irregularity of climatic conditions; and low pension allowances among those who had retired from their employment. On the basis of the above findings, the study recommends that artisanal gold mining be recognized, regularized and re-organized by the Ministry of Mines and Mining Development; that artisanal gold miners be encouraged to go for medical checkups on a regular basis; that they be assisted to acquire protective clothing and equipment; that they be deliberately assisted to forge partnerships with more established mining companies; and that Government makes concerted efforts to create employment and other alternative sources of livelihoods.

Key words: attitudes, knowledge, artisanal miners, health risks, chemical contamination

Introduction

Since independence in 1980, artisanal gold miners in Zimbabwe have experienced a series of health risks emanating from their trade. Some of the risks include loss of memory, kidney problems, blue line at gum margins, muscular tremors and madness (Shoko, 2014). Continuous exposure to chemicals such as mercury has led to the development of neurological challenges as well as genital deformities. In 1994, The Herald of 28th July reported that 100 soldiers had died while 1,000 others were evacuated from Chakari gold mining area near Kadoma. That was as a result of contaminated water from a disused mine.

The Newsday of 31st August 2014 carried an article on the impact of using mercury in gold mining in the Kadoma and Chakari areas. According to that article, gold miners had been affected by mercury through inhalation
and contact with the skin, particularly when bathing. The newspaper went on to say that mercury caused a lot of psychomotor problems, including loss of memory and madness.

In another article published by the Newsday of 31 August 2014, a human rights lobby group had warned that most children in Kadoma, who were born of mothers with high concentrations of mercury intoxication in the milk, were at risk of suffering from neurological challenges, as well as genital deformities.

**Statement of the problem**

Many researchers on artisanal gold mining have tended to focus on the physical and economic impacts of mining, thereby ignoring the health risks associated with the trade. In addition, the researchers who focused on the health risks threatening artisanal gold miners in Zimbabwe have not investigated the perceptions, knowledge and attitudes of the miners themselves towards those risks.

It was against this background that this study was conceptualized, namely, to understand the reasons why the miners continued to venture into this dangerous trade despite the health hazards.

**Objectives of the study**

The main objective of the study, therefore, was to establish whether the artisanal gold miners were aware of the health risks associated with their trade in Mhondoro Ngezi District. Specifically, the study sought:

a) To confirm the existence of chemical contamination within the blood streams of the artisanal gold miners in the Mhondoro-Ngezi District;

b) To establish the miners’ level of knowledge of the health hazards associated with gold mining; and,

c) To find out the underlining reasons why the miners continued with their dangerous trade.

**Significance of the study**

The study was considered significant because artisanal gold miners and their family could use the information from this study to take precautions and protect themselves against chemical contamination. In addition, pressure groups could use the evidence from this study to lobby responsible authorities to take action to protect the miners. Finally, the results from this study could benefit other researchers as basic reference material when investigating health risks associated with gold mining in other parts of the country and, indeed, the sub-region.

**Scope of the study**

The study was confined to Mhondoro-Ngezi District and surrounding areas such as Etina, Donain, and Venice in Mashonaland West. It focused on the knowledge and attitudes of artisanal gold miners regarding the health risks they were exposed to.

**Limitations of the study**

Although the researchers had assured the participants that the information obtained would be used for academic purposes only, some miners were still unwilling to participate in the study.

**Description of the study area**

Mhondoro-Ngezi District is located to the eastern end of Mashonaland West Province.
in Zimbabwe. The District is one of the poorest in Zimbabwe, with livelihood challenges such as unemployment, lack of clean domestic water, poor road systems, regular food shortages, and environmental degradation (Poverty Reduction Forum Trust, 2013). This is despite the fact that Mhondoro-Ngezi District lies along the Great Dyke, a vast area with ore deposits of platinum, chrome and gold.

**Literature review**

**a) Definition of terms**

Definitions of key words have been provided in order for the reader to understand the context of their usage. These are attitude, knowledge, perception, health risk and chemical contamination. In psychology, **attitude** was defined as an expression of favour or disfavour toward a person, place, thing, or event (Allport, 1935). The Business Dictionary has added that it is a predisposition or a tendency to respond positively or negatively towards a certain idea, object, person, or situation (http://www.businessdictionary.com/definition/attitude.html). It can thus be said that attitude is a settled way of thinking or feeling about someone or something, typically one that is reflected in a person’s behaviour towards that person or thing.

The Merriam-Webster’s Learner’s Dictionary defines **knowledge** as the body of truths, information, understanding, or skill acquired by a person through experience or education. It goes on to say that it is the theoretical or practical understanding of a subject, or familiarity, awareness or understanding of someone or something, which is acquired through experience or education by perceiving, discovering, or learning (www.learnersdictionary.com).

Before explaining what a health risk is, it might be useful to first understand what a **risk factor** is. According to www.who.int/topics/risk_factors/en, it is any attribute, characteristic or exposure of an individual that increases the likelihood of developing a disease or injury. Thus, according to the Collins English Dictionary, a health risk is something that could cause **harm** to people’s health (www.collinsdictionary.com/dictionary/english/health-risk). It may, therefore, be safely said that a health risk is a degree of likelihood that exposure to a hazardous substance may damage the health of the exposed person(s).

An **artisanal** miner or small-scale miner is, in effect, a subsistence miner. They are not officially employed by a mining company, but rather work independently, mining or panning for gold using their own resources (World Bank, 2006). The term Artisanal and Small-scale Mining (ASM) broadly refer to mining practised by individuals, groups or communities often informally and illegally (www.miningfacts.org/).

**b) Theoretical Frame Work**

This research was guided by the health risk perception theory or psychometric paradigm by Slovic (1987) and others. The theory assumes that people assess risk in a rational manner by weighing available information before making decisions. The critical aspect of this theory is that by providing people with information, one could alter their perceptions of the risk. (http://www.scienceblogs.com/...skpan/slovic).

However, subsequent research has demonstrated that providing more information alone will not assuage people’s fears and outlandish ideas about what is truly a risk because people’s perceptions of risk differ. While some judge risk in terms of quantitative assessments of morbidity and mortality, others see it as being far more complex and involving both psychological and cognitive processes (http://www.psmag.com/culture/driving-is-deadlist). Thus, Slovic
(1987) submitted that perception of risk may also be influenced by social, cultural and economic factors.

For example, nuclear power may score high as a risk than automobiles because nuclear accidents evoke widespread media coverage and warnings about possible subsequent catastrophes. On the other hand, automobiles may score higher because the risks of automobile accidents are often familiar and knowable. According to Harari, Harari, Gerhardson, Lundl, Skerfiving, and Strongberg (2012), anxiety about a risk may, in some cases, be a proxy for other social concerns; hence perceptions of risk are sometimes socially and culturally informed.

c) Existence of health risk among Artisanal Gold Miners

According to Harari et al. (2012), chemical contamination affects cognitive thinking, memory, attention, language and fine motor and visual spatial skills in infants and children exposed to mercury in the womb. A study among artisanal gold miners in Ecuador confirmed the existence of high levels of intoxication in children as mothers who had consumed fish that contained mercury ended up affecting the brains as well as nervous systems of their babies. According to the United Nations Environment Programme (UNEP) (2012), mercury in water bodies is transformed by anaerobic organisms, absorbed by phytoplankton, and then ingested by zooplankton and fish, thereby contaminating the food chain, including mothers’ milk.

In Bangladesh, a study carried out by AiRmalti, Jenkins, Watts, and Harris (2010) confirmed that maternal arsenic exposure in pregnant women was associated with low birth weight. The toxins tended to concentrate in the foetus because of its small size relative to the mother and the inability of the immature liver to detoxify the baby’s blood.

In Tanzania, Nyadza, Joseph, Thomas and Mannion (2014) found that, because of the toxic elements of arsenic and mercury, they were linked to adverse reproductive outcomes, neurological disorders and impaired cognitive development in children.

In Zimbabwe, a study conducted in the gold rich Kadoma area by the Centre for Natural Resources Governance in 2014, found that the mercury used by miners in purifying their gold found its way into local water sources. The Sunday Mail of 7th September 2014 added that, as a consequence, a woman gave birth to a severely deformed baby in a case that was suspected to be mercury poisoning (Mudyazhezha and Kanhukamwe, 2014).

The Newday of 31st August 2014 suggested that most children around gold mining areas were at risk of suffering neurological development challenges and genital deformities. This was after some women were found to have higher concentrations of mercury intoxication in their milk. These levels were 25 times higher than acceptable limits (World Health Organization, 2008).

d) Knowledge of chemical contamination

There are divergent views on whether artisanal miners are aware of the health risks they are exposing themselves to. Gavin, Christopher and Sandra (2006) submitted that artisanal gold miners were often not aware of the hazardous conditions under which they worked. However, Anankwah and Anim-Sackey (2003), and Petra and Kaimi (2006) argued that, in Ghana, artisanal miners were fully aware of the dangers of their operations, but were engaged in gold mining despite the known risks.

Similarly, Pereira (2009) stated that gold miners in the Pungwe River Basin in Mozambique used mercury to extract gold regardless of the health risks associated with the use of this chemical.
e) Reasons for Continued Mining Despite the Known Risks

The cases cited above imply that some artisanal gold miners are from socially and economically marginalised communities who turn to mining in order to escape extreme poverty. In Ghana, for example, artisanal miners were deliberately engaged in gold mining because of unemployment and landlessness, while others were in the trade because of low education (Anankwah and Amim-Sackey, 2003; Petra and Kaimi, 2006). In Mozambique, Pereira (2009) observed that artisanal gold miners used mercury to extract gold regardless of the health risks associated with the use of this chemical, because they were mainly driven by poverty.

According to UNEP (2012), in some instances, artisanal gold miners used chemicals because they were readily available as environmental laws governing their importation were not enforced. In Zimbabwe, a survey conducted by The Sunday Mail of 7th September 2014 revealed that mercury could be purchased over the counter in pharmacies and hardware shops, particularly in the gold mining towns such as Kadoma. There was no need for any form of licensing for one to purchase mercury.

Research Methodology

The research adopted a qualitative research paradigm. Although it was difficult to know the exact number of the miners, since they were always mobile in search of gold, close-ended questionnaires, structured interviews and observations were used to collect data from a sample size of forty seven (47) participants. Secondary data were gathered from textbooks, internet, other surveys, journals and newspapers.

Of the sixty (60) questionnaires that were administered, 43 were completed and returned, giving a 71.7% response rate. Six (6) gold miners failed to return the questionnaire because they had misplaced them. Other miners refused to complete the questionnaires for different reasons. Data from questionnaires, interviews and observations were then analysed and presented using of graphs, tables, bar charts and pie charts.

Data presentation and discussions

a) Demographic Profile of Participants

The 47 artisanal gold miners were made up of thirty seven males or 78.7% and ten females or 21.3%. In terms of age groupings, four categories of age were used, each with a span of ten years. The determination of age group was considered crucial in that it helped the researchers to assess the level of maturity of individual participants. Figure 1 below shows the age groupings.

![Figure 1: Age Groups of the participants](image)

Figure 1 shows that 41% of the participants were aged between 20-30 years. The least number of participants were aged below 20 years.

b) Data Presentation

The collected data have been presented according to the stated objectives of the study, that is: to confirm the existence and prevalence of chemical contamination; to
establish the level of knowledge about and attitudes towards the existing health risks; and to find the driving factors why miners continued their operations despite the known dangers.

i) Existence of Health Risk among Artisanal Gold Miners

The study revealed that there were many health risks associated with artisanal gold mining in the Mhondoro Ngezi District. Figure 2 below shows the health risks that were identified by the study. Most of these were associated with chemical contamination during mining.

Figure 2: Health Risks among Artisanal Gold Miners

Figure 2 above shows that, at the time of the study, skin irritations were prevalent among the artisanal gold miners. The study established that the irritations were a result of chemical contamination as miners used their bare hands to handle mercury, leading to chemicals being introduced into their bodies through the process of skin absorption. The researchers also observed that the miners and their families were using water from the separator for domestic purposes, especially bathing and washing of clothes. According to Shoko (2014), when people get into contact with contaminated water, they increase their chances of developing skin irritations.

Figure 2 also shows that tuberculosis (TB) was the second highest risk among the artisanal gold miners. Out of the 47 miners that were interviewed, 32% had been affected by TB. This was also confirmed by a local medical doctor who attributed the prevalence of the disease to the release of mercury within the breathing zone of the miners. The doctor stated that, in extreme cases, TB had even led to the death of some miners due to lack of treatment. He advised that the problem was exacerbated by lack of any personal protective clothing or equipment (PPE). The deaths were also confirmed by local Ministry of Health and Child Welfare officials.

The above findings are consistent with the findings by Salvornin, Niang, Diouf (2007) that miners in the Kedongon region of Senegal suffered from TB because of inhaling polluted air during burning and amalgam, as well as poor ventilation. Interestingly, Salvonin (2007) found that the miners were aware of the causes of their TB.

The study noted also that there was a strong correlation between contracting TB and the number of years in the gold mining trade. Table 1 below illustrates the correlations.

Table 1: Correlation between TB Incidences and Years in Mining

<table>
<thead>
<tr>
<th>Duration in gold mining</th>
<th>Number of gold miners</th>
<th>Number of miners affected by TB</th>
<th>Percentage of miners with TB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 1 year</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2-5 years</td>
<td>11</td>
<td>2</td>
<td>18.18</td>
</tr>
<tr>
<td>6-9 years</td>
<td>25</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>Above 10 years.</td>
<td>8</td>
<td>5</td>
<td>62.5</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>
As will be seen from Table 1 above, miners with less than one year in the trade were free from TB; eight (8) miners or 35% who had been mining for six to nine years had been affected; while five (5) or approximately 62.5%, out of eight (8) who had mined for more than 10 years suffered from TB. Thus, the likelihood of exposure to TB increases with the increase in the number of years in gold panning.

The study found that gastro-intestinal diseases were another health risk among the artisanal gold miners in the Mhondoro Ngezi District. This was due to drinking contaminated water. When water contaminated with mercury and cyanide finds its way into water bodies, it may, in turn, affect fish and other aquatic organisms. The researchers were informed that the consumption of fish from the Munzezi, Muzveze and Munyati rivers, as well as the Claw Dam, was a major cause of still births and/or deformed babies in the area. Plate 1 below shows water that is contaminated with mercury and cyanide flowing from an old gold mill.

However, the study found that 20% of the female participants did not believe that the still births and low birth weights were as a result of contaminated fish. Instead, they attributed them to other socio-cultural factors such as witch craft. This is in line with the submission by Slovic (1987) that the public’s perception of risk is sometimes influenced and justified using social and cultural reasons.

Finally, the study found that about 4% of the gold miners were affected by neurological problems as well as cancer. Some of the identified neurological symptoms included language disorders, memory loss and mental retardation. This finding is consistent with the findings of Harari et al. (2012) which showed that consumption of fish which contained mercury in Ecuador had adversely affected the babies’ growing brains as well as their nervous systems.

According to UNEP (2012), the mercury in water bodies is transformed by anaerobic organism into methyl mercury which is absorbed by phytoplankton, ingested by zooplankton and fish, thereby contaminating the food chain.

Plate 1: Contaminated water from a gold mill
ii) Knowledge of the Health Risks by Artisanal Gold Miners

The study also sought to establish the level of knowledge of the health hazards among the gold miners in the Mhondoro-Ngezi District. The study found that the miners were aware of some health risks but not others. For example, about 83% of them were aware of the health risk emanating from their activities. However, all the interviewed miners did not particularly attribute their skin irritations to chemical contamination, but to other reasons such as witchcraft.

iii) Why Miners Continue Mining despite the Health Risks

The study established the existence of health risks among the artisanal gold miners in the Mhondoro-Ngezi District and that about 83% of them were aware of health risks. However, the critical issue was why they continued mining despite the risks. The miners cited different reasons as indicated in Figure 3 below. The reasons included unemployment, poor and unreliable rainfall, low wages, and lack of safer chemicals.

About 80% of the miners stated that, despite the dangers of chemical contamination, unemployment was the major driver for illegal gold mining in the Mhondoro Ngezi District. Most of the miners were victims of Industrial closures and retrenchments in the formal sector in the nearby towns of Kadoma and Kwekwe, as well as in the country in general. Hence an increased number of people had resorted to mining to earn a living and make ends meet.

Another 74% indicated that they used dangerous chemicals due to lack of affordable substitutes in the recovery of gold. They argued that mercury, cyanide and caustic acid were cheaper and easy to get since they were sold in virtually all hardware shops. This was despite the fact that the law required all the providers to have licenses. The researchers were informed that, in some cases, illegal gold buyers either provided the chemicals in exchange for gold, or sold the chemicals at low and affordable prices to the gold miners. In other cases, the cost of getting a permit to register a mining claim was prohibitive. It was revealed that, for one to have a permit, one had to pay at least US$1000.00. Hence some miners resorted to illegal gold mining.

About 44% of the miners cited erratic rainfall that made farming an unattractive and unprofitable option. The miners argued that, while farming was a relatively low health risk occupation, it had low returns compared to mining. In addition, the costs of inputs like fertilisers and hybrid seeds were unaffordable, while the prices of cotton and maize were always fluctuating. At the same time, farmers often spent more than a year before they could get their money from the Grain Marketing Board (GMB).

Finally, about 5% of the miners indicated that they were aware of the health risks but that, after completing their high school education, they failed to get any form of employment in the formal sector; hence they resorted to gold mining. Similarly, 12.8% of the participating stakeholders felt that gold mining was the best alternative for those of their children who were without education. This reason tallies with the findings of Anakwah and Anim-Sacky (2003) in the Ashanti area of Ghana. Figure 3 below shows the reasons for continued gold mining despite the health risks in the Mhondoro-Ngezi District.
Conclusions and Recommendations

a) Conclusions

From the above findings, the study arrived at the following conclusions:

1. On the existence of health risks among artisanal gold miners in the Mhondoro District, the study established that, indeed, most artisanal gold miners were exposed to chemical contamination within their blood streams, leading to skin irritations, tuberculosis, damage to vision and still births.

2. Regarding the miners’ level of knowledge of the health risks associated with gold mining; the study established that the majority of the gold miners were aware of the health risks they were exposed to.

3. On the question why the miners continued with their dangerous trade despite the known risks, the study concluded that the main reason was widespread unemployment in the District and, indeed, the country. This was exacerbated by a paucity of alternative sources of livelihoods as well as unreliable income from farming.

b) Recommendations

In light of the above conclusions, the study recommends the following:

1. That artisanal gold mining should be regularized and the miners trained in the use of simple low-cost technology. This would enable the miners to operate as registered small scale enterprises.

2. That the cost of permits for artisanal gold panning be lowered to enable most of them to operate legally.

3. That the artisanal gold miners should be assisted to acquire protective clothing and equipment to minimize health risks.

4. That awareness campaigns carried out to encourage the miners to go for regular medical check-ups for early detection of the health risks.
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