A study on the environmental and health impact of mining activities on surrounding communities

Bindulekha D.S
Department of Zoology, Christian college, Kattakada
Thiruvananthapuram, Kerala

Received: 10 May Revised: 18 May Accepted: 26 May

Abstract

Mining industry is one of the important industries in the development of a country. The main objective of the study was to investigate the impact of mining activities on the environmental and health status of residents living near the mining site. To achieve this goal, quantitative data was collected using questionnaire method from hundred and ten residents randomly selected from the study area. The study analyse the sociodemographic status, and environmental and health status of respondents living near the mining site. The study found that air pollution (73.6%) followed by generation of dust from quarries was the most outstanding negative impact of quarrying operations identified by the respondents. Other problems identified include noise and ground vibration. Similarly, the most prevalent health problem of the nearby residents was identified as allergy (71.8%) and related disorders due to the inhalation of dust emitted from the mining site. In short, it is recommended that measures should be put in place to mitigate the high dust generation at the mining site and take concrete actions for the well-being of residents in the vicinity of quarry mining site.

Key words: Air Pollution, Dust emission, Environmental pollution, Health effects, Mining.

I. Introduction

Kerala state is endowed with a number of occurrences or deposits of minerals. But there is no large scale mining activity in Kerala as in other parts of the country. Almost all the mines are open cast and limited in areal extent. Mining and exploitation of mineral resources generally have a considerable impact on the land, water, air, and biological resources as well as socio-economic setting of the local population (Singh et al., 2010). Several studies have been conducted on the negative impact associated with environmental and health effects of mining activities (Pyatt et al., 2000; Ortega-Larrocea et al., 2010; Niyogi et al., 2002). However, the magnitude of impact depends on the methods, scale and concentration of mining activities, and the geological and geomorphological setting (Ghose and Majee, 2001). These environmental and health effects of mining activities have been attracting attention recently, hence, need to be addressed. Although, the mining company is believed to have made steps to improve health conditions of residents within the surrounding communities, however, the extent to which these efforts are reducing the negative environmental and health impacts is yet to be established (Yeboah, 2008).

One of the biggest negative impacts of mining on the environment is the damage to biodiversity (Anand, 2006). Biodiversity here refers to the range of living species including fish, insects, invertebrates, reptiles, birds, mammals, plants, fungi and even microorganisms. In
addition, multiple lines of evidence indicated that these various adverse effects of mining can occur at local, regional and global scales through direct and indirect mining practices. In addition to this, evidences are presented that mining raises various environmental concerns including swamp creation, deterioration of ground water, erosion of soil, land disturbance, emission of dust, smoke and fumes, noise and ground vibrations from rock blasting, and production of noxious gases (Olesugen et al., 2009; Langer et al., 2004). Though these operations are both size and locations dependent (Olesugen et al., 2009), manifestations of specific impacts are on the air, water, soil, earth surface, flora and fauna, and human beings (Areola, 1991; Enger and Smith, 2002).

Quarrying products are increasingly demanded for industrial, domestic, agricultural and other purposes so as to satisfy the needs of the rapidly growing population (Olesugen et al., 2009). Acknowledging the economic contributions of mining, environmental and health issues relating to mining activities are matters of concern within the public domain (Yeboah, 2008). A number of studies analysing the prevalence of health determinants of residents living nearby mining sites in various regions have been analysed, however, there are no consistent data evaluating health risk factors in the present area. In fact, concerns have been raised by the people living in the study area through the media about the impacts, run-offs and vibrations from quarrying activities on the health and well-being of the communities. Therefore, the present study was conducted to assess how, and to what extent, the quarry mining influence the health status of residents living near the mining area.

2. Study Area

The study area is located in the Therani Village in Kunnathukal-Perumkadavila Block Panchayat, about 34 km from south of Thiruvananthapuram District of Kerala State, which is located at 8°25’0’N and 77°5’0’E respectively.

3. Data Analysis

Quantitative data was collected using the questionnaires one hundred and ten residents randomly selected from the study area. Questions were asked on sociodemographic characteristics,
perception about quarrying activities in the area and their health experiences. Data generated from study sources were analysed and appropriate statistical test were done using instat 3 Graphpad Software. Explanations of the analyses were done qualitatively and quantitatively.

4. Result

Sociodemographic status of the respondents includes age, sex, occupation and educational status of respondents. Questionnaires were administered to indigenes that were between 20 and above 68 years old as can be seen in Fig.1. It shows that 25% of the respondents were in the range of 20-35 years, 39% between 36-50 years, 32% were in the range of 51-65 years and the rest which constitute 4% were 65 years and above. Respondents in the range of 36-50 years constitute the highest percentage. In the present study, 78% of the respondents are males while 22% are females (Fig.1). The result also shows that 54% of the respondents are engaged in farming and 18% in trading. 28% are professionals. Most of the respondents are, therefore, farmers and this requires perfect health for better performance (Fig.1). The result also shows that most of the respondents are engaged on one form of occupation or the other. Educational status of the respondents shows that 7% have no formal education while another 29%, 37% and 27% have primary, secondary and post secondary education respectively (Fig.1).

**Fig.1: Sociodemographic status of respondents living nearby mining site**
Most residents (51%) included in the study are live in houses situated more than 500 metres away from the quarry site. Similarly, 2% are less than 100 metres, 16% are 100-250 metres, 27% are 251-500 metres and 4% are more than 1000 m away from the quarry mining site (Fig. 2). Similarly, most of the residents (38%) have the residency duration for more than 20 years. While 5% have the residency duration for 1-5 years (Fig. 2).

**Fig: 2. Distance to mining Site and Residency Duration**

**Fig: 3. Pollution/Vibration Effects and Frequency of Dust Generation**

**Plate: 2. Dust generated from the mining site**
In the present study, 73.6% respondents agreed that dust is a great nuisance to them. Similarly, 12.7% respondents are irritated with noise pollution and 5.5% were irritated with ground vibration effects. 2.7% of respondents were irritated by both noise and ground vibrations. However, the residents living around the quarry sites are vulnerable to noise-borne or air pollution because of their proximity to the site (Fig. 3). Similarly, 21.8% of respondents were agreed that there is a continuous generation of dust in and around their residential area. Similarly, other responses were 31.8% occasionally, 34.5% daily and 11.9% observed weekly as the frequency of dust generation in their surrounding area due to mining operations (Fig. 3).

**Fig: 4. Diseases suffered by residents living nearby mining site**

Diseases suffered by residents living nearby mining site shows that 71.8% of the respondents experienced allergy as a result of operation of quarry mining in the area. 52.7% opined that they experienced tired and sleepless. While 37.2% and 39% of the respondents experience nasal infection and eye infection respectively. Similarly, 31.8% and 24.5% of the respondents opine that they experience cough and asthma respectively. Diseases like sinusitis (10%), hypertension (20.9%), Silicosis (6.4%), Gastrointestinal Problems (5.5%) are also prevalent in the area. However, 35.5% of respondents were suffered from other diseases. It also reveals that eye disease (eye irritation) and Respiratory disease (allergy, cough, asthma, nasal infection) is most common among the respondents living around the quarry area. It was observed that the residents in the community are exposed to the dust during quarry activities. The pollution produced from quarry activities affect the health of people living very close to the site thereby making live difficult to the residents (Fig.4).
Duration of the disease suffered by residents living near mining site shows that 17.3% of the respondents were suffered from various diseases for less than one year, 35.5% for one to three years, and 28.2% were three to five years and 19% for more than 5 years. (Fig.5). Similarly, satisfaction level of 8.2% of the respondents were excellent. 17.2% of respondents suggested as very good and 25.5% were good, 29.1% were fair and 20% were poor level of satisfaction with their surrounding area (Fig.5).

5. Discussion

In the present study, sociodemographic characteristics of the nearby residents reveal that most of the residents are farmers and this requires perfect health for better performance. The poor socio-economic status of residents living in close proximity to quarry sites may portend a negative implication for proper awareness of pollution arising from quarrying and the required capability to demand for compensation and or relocation of their settlements farther away from the quarry site. Daily generation of dust from quarries was the most outstanding negative impact of quarrying operations identified by the respondents. Other problems identified include air pollution, noise and ground vibration. Similarly, the most prevalent health problem of the nearby residents was identified as allergy and related disorders.

The various health problems suffered by the residents are those that associate with inhalation of dust in the air. This finding agrees with the reports of Murray and Lopez (1996) and Enger and Smith (2002). A few of the respondents experience a shock like effect due to sudden noise from the use of explosives and ground vibration that result from rock blasting. It has been previously reported that the detonation of explosives in quarrying operation causes ground vibration, which produces effects such as stress, anxiety, and increased pulse rate, loss of sleep, fatigue and excessive contraction of pupil among residents living near quarry site (Salvato, 1992; Alloway and Ayres, 1995). Mate (1992) suggested that the dust problem related particularly to surface mines was found to have caused a nuisance to resources close to sites. Nuisance is
generally related to the visual effects observed by receptors, such as the soiling of surfaces over days and weeks or the short term visual effect of clouds of dust.

Several studies have been conducted on the negative impact associated with environmental and health effects of mining activities (Banez et al., 2010; Chatwal, 1999; Murray and Lopez., 1996; Salvato, 1992). Banez et al., 2010 reported that respirable particles, those that are less than 10μm in diameter have the potential to cause effects on human health, including effects on the respiratory and cardiovascular systems. According to them, inhalation of dusts can cause “pneumoconiosis” which is a term that refers to a group of lung diseases. Similarly, Stephens and Ahern (2001) reported that, mining remains one of the most perilous occupations in the world, both in terms of short term injuries and fatalities, but also due to long term impacts such as cancers and respiratory conditions such as silicosis, asbestosis, asthma and pneumoconiosis. Nene (2011) suggested that asthma is caused by a combination of genetic and environmental factors but that particulate matter inhalation increases the severity of asthma.

The noise pollution reported in the study area is resulting from blasting, drilling, crushing, loading, unloading, machineries and transportation. The source of noise and vibration in the area comprise mobile equipment, air blasts and vibration from blasting and other machinery. It has been previously reported that the impact of high-pitched and other noises is known to include damage to the auditory system, cracks in buildings, stress and discomfort (Akabzaa and Darimani, 2001). These noises can also terrify animals, hinder their mating processes and also cause abortions, therefore adversely affecting the animal population (Salvato, 1992). Likewise, noise as a pollutant produces contaminated environment similar to our study site, which becomes a nuisance and affects the health of a person, his activities and mental abilities (Chatwal, 1999).

6. Conclusion

This study was an attempt to analyse some aspects of environmental and health impacts of mining on surrounding communities. Since it is a preliminary study, further collections are essential for getting a detailed record of the adverse effects of mining in the present area. However, the present study provide a concrete evidence that due to the dilution and spread of particulates from quarry sites to other locations, residents living nearby mining site experience multiple episodes of respiratory ailments and similar health issues.

Acknowledgement

I would like to express my sincere gratitude and profound appreciation to the Department of Zoology, Christian College Kattakada for providing the facility and encouragement to carry out the present work.
References


