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The Use of Health and Safety Equipment in the Emerald Mines of Swat Valley, Pakistan: A Cross-Tabular Descriptive Analysis of Miners' Views

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ABSTRACT

This study is about the non-use of health and safety equipment in the emerald mines of Swat, Khyber Pakhtunkhwa, Pakistan. The paper draws on the findings of a survey of 300 miners working in the active emerald mines of Swat Valley. The survey was conducted to develop descriptive statistical data about various aspects of miners' work. However, this paper descriptively presents the findings about the non-use of health and safety equipment in the mines. We sampled 300 gemstone miners from Swat Valley through a convenient sampling technique. The study finds that miners only use protective shoes, hard hats, and, occasionally, hearing conservation. They never use reusable respirators, half-facepiece respirators, full-facepiece respirators, air respirators, push-to-fit earplugs, reusable earplugs, earmuffs, and protective eyewear, thus making them vulnerable to injuries and casualties. Similarly, miners rarely use filter facepiece respirators, disposable respirators, power air-purifying respirators, foam earplugs, and reflective materials as limited to one of a hundred individuals. The use of modern protective equipment could only be ensured if the government takes strict action for the implementation of state policies about mining and by extending financial support and provision of safety equipment at the doorstep of miners.

1. INTRODUCTION

The usage of safety equipment in gemstone mining is highly important for miners to protect their lives from injuries and accidents. It mainly includes personal protective, evacuation, monitoring, prevention, communication, and warning signs related equipment and tools such as hard hats, protective shoes, eyewear glasses, earmuffs, highly visible clothes, respirators, portable breathing apparatus, gas detectors, fire extinguishers, fire resistant materials, communication tools, safety nets, first aid kits, on-site health practitioners, and mine ventilation system, etc. Such equipment and safety measures minimize the risk of injuries and fatalities during mining (Elevli and Elevli, 2010). Unfortunately mining in Pakistan is carried out without proper use of the required equipment and safety measures, which results in the loss of human lives.

Miners commonly encounter safety issues as they use explosives and outdated technologies (Bangash and Owais, 2023). Pakistan's mining industry reportedly lacks technical know-how, modern equipment, financial capital, and trained manpower; the locally customized safety equipment and practices are hazardous to the miners' health as well as the environment (Husain, 2005). Similarly, Alam et al., (2022) highlighted that gemstone mining is getting difficult day by day due to various forms of hardships such as costly mining equipment, government restrictions, weather conditions,

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exploration licensing issues, and lack of safety equipment. They further added that miners lack basic safety equipment such as masks, goggles, gloves, mining shoes, and helmets. Consequently, miners suffer from diseases such as silicosis due to the fumes of explosives.

The law requires that a mining manager and surveyor be appointed in each mine, who are responsible for workers' safety. In practice, however, being on the payroll of petty contractors, such incumbents merely toe the employers' lines and cannot be assertive due to fear of losing their jobs in safety matters (Salim, 2001). Although laws governing the health and safety of miners have existed for a long, nonetheless, their violation both in private and public spheres poses serious life threats to miners. For instance, most Pakistani mines enact wooden structures that have greater chances of collapsing instead of robust structures. Similarly, the established train tracks in mines are also substandard followed by inadequate lighting. As a result, accidents happen all the time around mines. Mine accidents are not only limited to Pakistan but also found in other underdeveloped and developing parts of the globe. The per year fatality rate in Tanzania gold mining is 5 percent which is mostly the result of a lack of safety measures in small-scale mines (Noetstaller, 1995). The lack of safety management leads to damage to property, accidents, and loss of human lives; if effective safety management is placed, it reduces the rate of laborers' death during mining (Thirumalai, Seenivasan, and Sivakumar, 2021). In the context of Afghanistan, Bowersox et al. (2007) found that gemstone mining is carried out with antiquated equipment and tools, mainly hand work that is done without automated tools. No safety and health regime is in place; they even lack safety footwear, gloves, goggles, helmets, etc.

Deaths and casualties always remain hidden in gemstone mining due to illegal, small-scale artisanal and subletting of mines, etc. In this regard, Bangash and Owais (2023) stated that neither the mining nor mineral department of Gilgit-Baltistan have any ideas about the number of injuries and casualties nor it is shared by miners as they are not registered with the department. Fatal incidents are routine in Pakistani mines and every year a huge number of miners become victims of discharge of poisonous gases or due to collapsing mines (Salim, 2001). He further concluded that miners are very precarious and such deaths speedily become a norm rather than an accident. It is due to that miners are not even aware of the names and uses of safety and health equipment such as protective eyewear, reusable respirators, foam earplugs, push-to-fit earplugs, powered air-purifying respirators, filtering facepiece respirators, reflective materials, air respirators, reusable earplugs and hearing conservation etc., and miners only used protective shoes and hard hats (Bangash and Owais, 2023). In the case of a worker escaping from death in a mine accident, he is most likely to end up losing limbs; about five to six years of prolonged exposure to and inhalation of dust during mining make miners vulnerable to skin diseases and other physical ailments such as Tuberculosis (TB) and asthma (Salim, 2001). Gemstone mining in Pakistan is as potentially hazardous as mining for other items. Yet, it is almost impossible to access accurate statistics about the number of casualties, injuries, and diseases that occur due to the lack and non-usage of safety equipment.

Keeping in view the foregoing brief review, the data reported in this paper was collected with a view to assess whether miners working in the emerald mines of Swat had any information or experience of using a series of health and safety equipment or not. Thus, the paper hypothesized that owing to the lack of appropriate monitoring of the mining sites, the gemstone miners would neither have heard about, seen, nor used a set of health and safety equipment for mining. This paper reports on the non/use of health and safety measures in the emerald mines of Swat as an effort to contribute to a first-hand account of the type of equipment that miners reported to have heard about, seen, or used during mining. The methodological details including the data collection procedures are described in the next section below.

2. METHODOLOGY

This study is based on quantitative data collected as part of a research project funded by the Higher Education Commission (HEC) of Pakistan. The project, Factors Inhibiting Beneficiation of Gemstones in Pakistan: a mixed-methods Value Chain Analysis of Mining and Trade in the Gemstone Industry of Khyber Pakhtunkhwa and Gilgit-Baltistan, was funded under HEC's Local Challenge Fund (LCF) scheme. The data was collected from 300 miners working in Emerald mines in Swat Valley, Khyber Pakhtunkhwa, Pakistan.

Extant literature is silent about the non-use of health and safety equipment and measures in Swat mines. Therefore, we conducted two stakeholder workshops, one at Bacha Khan University Charsadda and another in Swat. We also conducted semi-structured interviews with miners. The proceedings of the workshops and interviews were analyzed thematically to generate question topics for inclusion in a survey questionnaire. Owing to the lack of previous reports and data about the non-use of health and safety equipment, we designed the questionnaire to generate descriptive statistics about various issues and problems faced by the miners in Swat. The questionnaire was divided into three major sections: (1) socio-demographic profile (2) work area: location, conditions, equipment, health & safety, and (3) problems and opportunities associated with mining.

We asked questions about the non/use of the following health and safety equipment (1) Filtering Facepiece Respirator, (2) Disposable Respirators (Mask) such as N95, (3) Reusable Respirators, (4) Half Facepiece Respirator, (5) Full Facepiece Respirator, (6) Air Respirator, (7) Powered Air Purifying Respirator, (8) Hard Hats, (9) Hearing Conservation, (10) Foam Earplugs, (11) Push-to-Fit Earplugs, (12) Reusable Earplugs, (13) Earmuffs, (14) Protective Eyewear, (15) Reflective Material (High Visible Jacket), (16) Protective Shoes. During the interviewing process, we learned that very few miners had basic literacy. Therefore, the enumerators were handed over a chart that had the name and picture of each of the above-listed items; they were advised that when they reached the questions about the non-use of the health and safety equipment, they would pinpoint each item on the chart so that respondents could understand the intent of the question. The respondents were asked to report whether they had ever (1) heard about, (2) heard about and seen, or (3) heard about, seen, and used these items. During data analysis we recoded the response categories into (1) heard about, (2) heard about and seen, (3) 'used', and (4) 'none of these.'

We used convenient sampling to collect data from 300 respondents. Convenient sampling was used because leaseholders usually did not regularly maintain a register of the labor force working on all of their mining sites. Secondly,

turnover is almost a permanent feature in gemstone mining. Thus, even if a leaseholder maintained recruitment registers of workers, it would still be naïve to take that as a valid sampling frame for drawing the sample randomly. Finally, at the time of the fieldwork, the Fiza Ghat mines were closed due to litigation between the leaseholder and the government of Khyber Pakhtunkhwa, while the Shamozo mines had just been leased out by the government where proper mining had yet to begin. As a result, the researchers subscribed to a combination of convenient and respondent-driven sampling to identify and collect data from the dormant mine workers. The data regarding the non/use of health and safety equipment was cross-tabulated with the marital status of the respondents to determine the association between both sets of variables.

3. RESULTS & FINDINGS

In the following table frequencies of married, unmarried, and divorced respondents are cross-tabulated with 16 safety health and equipment to generate a descriptive presentation of their views in terms of (1) heard, (2) heard and seen, (3) heard, seen, and used, and (3) none.

Table 1
Descriptive Presentation

Statements	Marital Status	Heard about	Heard about & Seen	Used	None	Total
Filtering Facepiece Respirators	Unmarried	6	1	1	22	30
	Married	61	33	3	172	269
	Divorced	0	0	0	1	1
	Total	67	34	4	195	300
Disposable Respirators (Mask) such as N95	Unmarried	2	7	2	19	30
	Married	32	71	10	156	269
	Divorced	0	0	0	1	1
	Total	34	78	12	176	300
Reusable Respirators	Unmarried	3	0	0	27	30
	Married	36	2	0	231	269
	Divorced	0	0	0	1	1
	Total	39	2	0	249	300
Half Facepiece Respirator	Unmarried	5	0	0	25	30
	Married	32	10	0	227	269
	Divorced	0	0	0	1	1
	Total	37	10	0	253	300
Full Facepiece Respirator	Unmarried	2	0	0	28	30
	Married	17	9	0	243	269
	Divorced	0	0	0	1	1
	Total	19	9	0	272	300
Air Respirator	Unmarried	1	0	0	29	30
	Married	9	5	0	255	269
	Divorced	0	0	0	1	1
	Total	10	5	0	285	300
Powered Air Purifying Respirator	Unmarried	1	0	1	28	30
	Married	3	2	0	264	269
	Divorced	0	0	0	1	1
	Total	4	2	1	293	300
Hard Hats	Unmarried	0	0	29	1	30
	Married	0	2	267	0	269
	Divorced	0	0	1	0	1
	Total	0	2	297	1	300
Hearing Conservation	Unmarried	0	0	30	0	30
	Married	11	0	258	0	269
	Divorced	0	0	1	0	1
	Total	11	0	289	0	300
Foam Earplugs	Unmarried	1	0	0	29	30
	Married	15	7	1	246	269
	Divorced	0	0	0	1	1
	Total	16	7	1	276	300
Push-to-Fit Earplugs	Unmarried	3	1	0	26	30
	Married	25	7	0	237	269

	Divorced	0	0	0	1	1
	Total	28	8	0	264	300
Reusable Earplugs	Unmarried	3	1	0	26	30
	Married	18	7	0	244	269
	Divorced	0	0	0	1	1
	Total	21	8	0	271	300
Earmuffs	Unmarried	3	1	0	26	30
	Married	13	8	0	248	269
	Divorced	0	0	0	1	1
	Total	16	9	0	275	300
Protective Eyewear	Unmarried	2	0	0	28	30
	Married	6	3	0	260	269
	Divorced	0	0	0	1	1
	Total	8	3	0	289	300
Reflective Material (High Visible Jacket)	Unmarried	0	0	1	29	30
	Married	6	3	0	260	269
	Divorced	0	0	0	1	1
	Total	6	3	1	290	300
Protective Shoes	Unmarried	0	0	30	0	30
	Married	0	27	241	1	269
	Divorced	0	0	1	0	1
	Total	0	27	272	1	300

The results in the above table show that out of the total, 06 unmarried and 61 married respondents had only heard about filtering facepiece respirator, 01 unmarried and 33 married respondents had heard about and seen it, 1 unmarried and 3 married respondents had used it; 22 unmarried, 172 married and 1 divorced respondent had never used, seen or heard about the equipment. Regarding disposable respirators (Mask) such as N95, 2 unmarried and 32 married respondents had heard about it, 7 unmarried and 71 married respondents had heard and seen it, 2 unmarried and 10 married had used it while 19 unmarried, 156 married and 1 divorced respondent had no idea about disposable respirator as they had never heard, seen, or used it.

When the respondents were shown the picture of a reusable respirator, 3 unmarried and 36 married respondents contended that they had heard about it, 2 married respondents also had heard about and seen it while 27 unmarried, 231 married and 1 divorced respondent stated that they had not heard about, seen or used reusable respirator during mining. Likewise, 5 unmarried and 32 married respondents stated that they had heard about the half-facepiece respirator, 10 married had heard and seen it while 25 unmarried, 227 married and 1 divorced respondent contended that they had not used, heard about, or seen the half-facepiece respirator. Similarly, when the respondents were asked about full-facepiece respirators, 2 unmarried and 17 married respondents said that they had heard about it, 9 married respondents had heard and seen it while the rest of 28 unmarried, 243 married, and 1 divorced respondent had never used, heard about, and seen a full-facepiece respirator.

Regarding the air respirator, 1 unmarried and 9 married respondents reported having heard about it, 5 married respondents had heard about and seen it and the rest of the respondents (29 unmarried; 255 married and 1 divorced respondent) had neither heard, seen, or used it. In a similar vein, 1 unmarried and 3 married respondents had heard about the powered air purifying respirator, 2 married had heard about and seen it, and only 1 unmarried respondent had used the item; the rest of the respondents, i.e., 28 unmarried, 264 married and 1 divorced, had no idea about 'powered air-purifying respirators. Regarding the use of hard hats, 29 unmarried, 267 married, and 1 divorced respondent stated that they had used it. Merely, 2 married respondents stated that they had only heard about and seen the item, but had never used it during mining; 1 unmarried respondent had no idea about it.

30 unmarried, 258 married, and 1 divorced respondent had never heard about, seen, or used hearing conservation; 11 married respondents had heard about it. Regarding, foam earplugs, 1 unmarried, 15 married respondents heard about it, 7 married had heard about and seen it, and 1 married respondent had used it while the rest of the 300 respondents, i.e., 29 unmarried, 246 married and 1 divorced, had no clue about the item. Likely, 3 unmarried and 25 married respondents had heard about push-to-fit earplugs, 1 unmarried and 7 married heard about and seen it, and the remaining – 26 unmarried, 237 married, and 1 divorced – respondents had neither heard about, seen, or used this health and safety equipment. The findings regarding reusable earplugs are almost in consonance with these results: 3 unmarried and 18 married respondents had heard about reusable earplugs, 1 unmarried and 7 married heard about and seen it, while 26 unmarried, 244 married, and 1 divorced respondent had no idea about it. Similarly, 3 unmarried and 13 married respondents had heard about earmuffs, 1 unmarried and 8 married had heard about and seen it, and the rest, i.e., 26 unmarried, 248 married, and 1 divorced respondent, had neither heard, seen, or used earmuffs.

Regarding protective eyewear, 2 unmarried and 6 married respondents said that they had heard about it, 3 married respondents had heard about and seen it; the rest of 28 unmarried, 260 married and 1 divorced respondent had neither heard about, seen, or used protective eyewear. 6 married respondents mentioned that they had heard about reflective material (high-visible jacket), 3 married respondents had heard about and seen it, and 1 unmarried respondent had used it. The remaining respondents, i.e., 29 unmarried, 260 married, and 1 divorced, contended that they had neither heard about, seen, or used a high-visible jacket. Lastly, 30 unmarried and 241 married and 1 divorced respondent stated that they had used protective shoes; 27 married respondents stated that they had only heard about and seen the item, while 1 married respondent had no idea about it.

Discussion

Swat is known for its industrial and gemstone mining. Yet, as we have contended above, no records or data are available about the number of active emerald mines and their total workforce. Perhaps, it is safe to assume that thousands of miners are either directly or indirectly connected with mining in the valley. The government's regulatory authorities are supposed to ensure active use of health and safety measures. However, in Swat, most miners do not have access to health and safety measures making them at risk of minor and major injuries during mining. The findings of this study indicate that, owing to the lack of awareness and use of most of the health and safety equipment, gemstone miners in Swat work in precarious conditions. In most cases, they are unaware of the basic safety equipment used during mining. They have no idea about Filtering Facepiece Respirators which are commonly used during mining as only a minimal number of miners used the same. The most commonly used Disposable Respirators (masks) such as N95 are rarely used by miners in the valley as only a small number of miners use N-95 masks during mining. Since commonly used disposable respirator is not used, it is not surprising to find that miners have not seen or used Reusable Respirators, Half-Facepiece Respirators, Full-Facepiece Respirators, and Air Respirators. Similarly, Powered Air Purifying Respirators are rarely used by miners in the valley as a very minimal number of miners reported about it. Hard hats are commonly used by miners during mining but the same is not at par with international standards. During the fieldwork for qualitative interviews with miners, we found them wearing hard hats. However, according to them, should rocks or debris fall off during mining the safety helmets could bear 4-5 kilograms of weight. Likewise, Hearing Conservation is also not commonly used by the miners in Swat Valley. Miners are less aware of the importance of Foam Earplugs during mining as they are rarely used as a very small number of miners use the same. Similarly, Push-to-Fit Earplugs, Reusable Earplugs, Earmuffs, and Protective Eyewear are never used by miners in the valley even though they have no idea about the same. High Visible Jackets are rarely if ever in use by miners during mining in Swat Valley and lastly. Finally, although most miners wear shoes to protect their feet from harm, the shoes are not of the industrial standard; rather, they were mostly found wearing shoes made of plastic.

4. CONCLUSION

The study concludes that the usage of safety equipment in gemstone mines of Swat is not at par with international standards; they could neither be expected to be per the SOPs of the Mineral Development Department of Khyber Pakhtunkhwa. Miners usually use just two pieces of protective equipment: shoes made of plastic, and hard hats which can at the most bear 4 to 5 kilograms of weight. Further, reusable respirators, half-facepiece respirators, full-facepiece respirators, air respirators, push-to-fit earplugs, reusable earplugs, earmuffs, and protective eyewear were never used by miners during mining. Lastly, some miners heard about filtering facepiece respirators, disposable respirators, powered air-purifying respirators, foam earplugs, and reflective materials but these have hardly been used during mining; their use is limited to one out of a hundred individuals. The onus of responsibility lies with the leaseholder and the concerned government authorities. The government agencies, especially, the Mineral Development Department of Khyber Pakhtunkhwa could take appropriate steps to make it mandatory for leaseholders to observe health and safety protocols in and around mines. Similarly, it should regularly monitor the mining sites for compliance with ethical and responsible sourcing of gemstones in Swat and elsewhere in the province.

Competing Interests

The authors did not declare any competing interest.

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