ABSTRACT

Tracing the history of diamonds revealed that these precious stones were first mined in India. But today apart from a few mines in the states of Madhya Pradesh, Andhra Pradesh and Orissa, the mining of rough stones is very low. Although India is not producing many rough stones, it is one of the largest exporters of finished diamonds globally. It leads the world in the diamond cutting and polishing industry and this sector substantially contributes towards the economy of the nation as it is a major source for the country's foreign exchange. Earlier, India was not polishing diamonds of very high quality but gradually the output improved and with the use of latest technology and softwares India started producing exquisite pieces of this precious gem that gave tough competition to other leading diamond polishing countries like Israel and Belgium. The availability of skilled and cheap labour further helped in creating a favourable environment in which this industry flourished. In India also very few places have an established diamond cutting and polishing industry. Cities like Mumbai and few cities in the Southern region of the country have a few industries but the chief hub for diamond cutting and polishing is Surat city, located in Gujarat state. India majorly imports rough stones from countries like Russia, Democratic Republic of Congo and Botswana. The stone is first sent to the cutting unit where it is marked using softwares to get the best value out of the piece. Laser cutting technology is used nowadays to get the perfect cuts on the stone. Once the piece is cut, it is sent for polishing which is a process that is highly labour intensive and needs a lot of skills and an eye for detail. The polishers rub each piece of stone on a revolving wheel of metal and polish each facet of a diamond piece to provide it the shine. Polishing a piece of diamond requires a lot of patience, long hours of input and an expert eye to get the desirable output. Polishing a brilliant cut diamond that has 57 facets involves a five step process. The first step is polishing the 'table' of the diamond which is the topmost flat facet. The next step is 'girdle rounding' which is a computerised process of giving the shape to the diamond. The third step is polishing the 'talia' i.e. the 24 facets of the pavilion. And this is followed by polishing the 'athpel' and 'mathala' i.e. the top 8 and 24 respectively of the diamond. After a final inspection of this stone, the diamond is then ready to be used for commercial purposes. Since all of this work requires the workers to sit for long hours in uncomfortable positions, doing work that is highly skilled and requires a high degree of concentration, the researcher was interested in studying their work environment. Thus, the researcher undertook this study in small polishing units

with 50 or less workers involved in the polishing process in order to study the problems and hazards that they experience in their occupation. The researcher was also interested in studying the background of the Surat diamond polishers. Based on the problems and hazards identified, the researcher proposed coping strategies and also suggested comfort enhancing products to the workers that will help in reducing some of the physical hazards.

For the present study a descriptive research design was adopted which was appropriate to gather information regarding the polishers working in small units and also to assess the problems and hazards that they face. Snowball technique was used to select 15 small diamond polishing units from Surat city. Purposive sampling technique was used to select 500 respondents, 100 each from the five polishing activities namely, 'table work', 'girdle rounding work', 'talia work', athpel work' and 'mathala work'. Interview schedule and observation sheet was used to collect the required data and it consisted of three sections. Section I collected the background information of the respondents and was further divided into three subsections namely, the personal information of the respondents, family related information and work related information. Section II aimed at collecting information regarding the problems experienced by the respondents and was further divided into two subsections namely the physiological problems and the psychosocial problems. The physiological problems studied the chronic diseases, respiratory problems, musculoskeletal problems and other problems related to the eye, ear, skin etc. The psychosocial problems on the other hand studied the problems related to social factors at work, work organisation and the work environment. Section III studied the ergonomic hazards and hazards caused due to the physical environment of the workplace. The Nordic Body Map was used to assess the perceived musculoskeletal pain experienced by the workers in different parts of the body. Out of the 500 respondents, 50 respondents were selected and through observation method RULA scale was used to study the postural load requirements of the job tasks on neck, trunk and upper extremities of the body. An indoor outdoor thermometer with hygrometer, digital noise meter and digital lux meter was used to measure the temperature, humidity, noise and light respectively in the polishing units.

The data obtained was then categorized, coded, tabulated and statistically analysed. For analyzing the data, descriptive analysis and tests like Coefficient of Correlation, Kruskal

Wallis H Test and Dunn's Multiple Comparison Test (post hoc test) were used. The major findings of the study revealed that the diamond polishing industry is majorly a male dominated industry with the mean age of 35.28 years. Out of the 500 respondents, 185 respondents had migrated from other locations to Surat to work in this industry and the major reason reported for migration was the desire to earn more. The years of work experience in the diamond industry ranged from 2 years to 37 years and 63.8 per cent of them reported that they got the present job through reference. Hypertension, allergy to pollution, fatigue and tired eyes were some of the highly reported physiological problems that the respondents attributed to the nature of work that they were doing. On the other hand, poor communication between co-workers, work hours not being flexible, frustration, work being monotonous, inadequate ventilation and uncomfortable temperature were some of the psychosocial problems faced by the respondents. Upon studying the ergonomic hazard faced by the respondents, it was observed that the perceived musculoskeletal pain was majorly reported for the 'back', 'buttock', 'bottom' and 'left shoulder'. Most of the problems were reported by polishers doing the 'mathala work' and the least complaints were reported by workers involved in 'girdle rounding'. Most of the workers were exposed to medium and high levels of risk. RULA scale was applied to 50 selected workers and the results showed that 50 per cent of the polishers belonged to the score 5-6 category meaning that further investigation and change would be required soon. Also, 22 per cent belonged to the score 7 category meaning, they required investigation and implementation of change at the earliest. Upon studying the physical environment of the workplace, it was observed that the indoor light levels, humidity and noise levels were maintained at the recommended levels, however adequate artificial and natural ventilation can make the indoor temperature more comfortable. Coping strategies like following a healthy lifestyle, taking enough rest breaks, adopting appropriate postures and maintaining a positive attitude was suggested by the researcher. The researcher also developed comfort enhancing products to reduce some of the physical issues faced by the workers. An ergonomic floor seat, a detachable padded seat with backrest, ear muffs, foot rest and eye exercise posters were designed by the researcher for the purpose. The products were given to the participants and informative posters were put up in the units. The products were found to be useful in providing them comfort and reducing some of the physical problems significantly. Thus, the present study is a valuable resource for the workers involved in the diamond polishing process as it will sensitize them to the problems and hazards that they face and will help in coping with

them. The comfort enhancing products can be used in the industry and industries of similar nature in order to reduce the physical hazards faced by the workers.