WORKERS IN DIAMOND INDUSTRY: OCCUPATIONAL HEALTH HAZARDS, PROBLEMS AND COPING STRATEGIES

SYNOPSIS

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INTRODUCTION

A classic saying that has stuck with us for a very long time is - "A Diamond Is Forever." As part of their marketing efforts, the renowned diamond supplier De Beers coined this expression in 1948 (Peveto A, 2013). It's interesting to note that both coal and diamonds contain carbon. However, coal is composed of carbon and other impurities like nitrogen, arsenic, selenium, etc., whereas diamond is pure carbon that has a crystalline structure. Diamonds are created when extreme heat and pressure combine with a high degree of purity (Platt J, 2020). This priceless stone, which is frequently seen as a symbol of love, travels a very long and difficult path to become what is known for its beauty and elegance.

Scenario of Diamond Industry

According to reports, three nations—Russia, the Democratic Republic of Congo, and Botswana—are home to at least 80.6% of the world's diamond reserves. Before they can be used, the mined stones, also known as rough diamonds, must go through a number of processing steps. Such processing calls for specialised and competent workers with an eye for detail who can turn plain stones into brilliantly glittering jewels. In just a couple of nations worldwide, diamonds are cut and polished. These nations initially import uncut diamonds before exporting the completed product to the rest of the globe. One of the major players in diamond cutting and polishing is Ramat Gan, which is located in Israel. The Antwerp diamond area is where large-scale diamond cutting and polishing takes place in Belgium. The Chinese cities of Guangzhou and Shenzhen also have diamond cutting operations. In addition to these locations, cutting of diamonds is also carried out in the US, South Africa, and Russia[1].

Although diamonds were first discovered in India thousands of years ago near the Krishna and Godavari rivers, currently only a few mines in Madhya Pradesh, Andhra Pradesh, and Orissa are actively engaged in diamond mining. There is very little production of rough stones coming from Indian mines. However, India is the world leader in the cutting and polishing of imported rough diamonds before the polished diamond is exported to the global market (Dhadus, N. K., 2015). One of the main contributors to India's economic growth and its foreign exchange earnings has been the country's diamond industry. It is one of the industries with the fastest growth rates, making up 7% of the GDP and 15% of all exports from India. Additionally, it employs millions of people, a number that is anticipated to reach 8.23 million by the year 2022[2].

The diamonds polished in India were initially of inferior quality, but as innovations took place, competition was gradually felt in Antwerp and Israel in the 1970s (Goldwasser, 1970). Although many Asian nations, including Sri Lanka, Thailand, and China, attempted to enter this market, they were unable to match India's level of production.

However, the story in India is somewhat different. India polishes nine out of every ten diamonds that are polished worldwide. And the Surat Diamond Industry is responsible for 75% of this contribution. Each year, the nation imports $11 billion worth of unpolished diamonds, 80% of which originate from Antwerp and 20% from diamond mining companies. Surat city accounts for more than 80% of India's annual exports, or Rs 70,000 crore. More than 1.5 million city residents work in this sector[3]. The inexpensive and readily available workforce as well as the close proximity to the rough diamond sources, such as Africa, are two factors that have contributed significantly to the success of this business.

Converting Rough Stones into Diamonds

A rough stone goes through a number of steps before becoming a brilliant diamond. The first step in the process is the mining of roughs, which takes place in certain sites across the world and may require several years and a large amount of labour to gather a sizable quantity of stones that may be transformed into diamonds. The cutting and polishing units get the roughs next. Cutting and polishing is an extremely complicated procedure that requires trained employees and is partially automated and sometimes manual. First, a computer programme is used to mark the rough stones. This technique involves estimating the optimal approach to cut the rough stone in order to get the most valuable results. Once the stone has been marked, it is sent for laser cutting, an autonomous procedure that requires little human oversight. The diamond is given to the polishing unit once it has been cut. Since polishing a diamond is entirely a human process, the final outcome depends on the talents of the diamond polishers. Each stone is rubbed against a rotating wheel until the desired result is obtained. The polishers' experience and expertise affect the diamond's quality and brilliance. The final product is ready to be exported into the market to be sold once it has undergone inspection.

Problems at Workplace

Every industry has its own set of issues that employees must deal with on a daily basis. These issues may be industry-specific and created by the nature of the industry, or they may be caused

by external variables such as the location, culture, and demography of those engaged in the industry.

a. Physiological Problems

Physiological diseases are caused by the body's organs malfunctioning or failing to operate effectively, or by the true cellular structures changing over time, affecting the body's ability to function regularly or properly and resulting in illness[4]. Chronic illnesses, respiratory issues, musculoskeletal disorders, and problems with other organs such as the eye, skin, and ears are examples of physiological problems.

b. Psychosocial Problems

All problems that are not technically medical or physical are classified as psychosocial difficulties. They influence how a person performs in daily life, as well as his or her surroundings and/or life events. It covers psychological issues such as stress, anxiety, depression, substance misuse, sleep disorders, marital issues, eating disorders, and so on, as well as social issues such as financial issues, socio-cultural issues, and work-related issues (Vannieuwenborg, L., et al 2015). Today's workers are coping with psychological challenges that can be highly stressful, and this stress is likely to have a negative impact on both their capacity to perform successfully at work and their personal traits. It has been demonstrated that psychological problems have an impact on stress levels, resulting in a decrease in workers' self-esteem and loyalty to the organisation (S. Choi, J. Lee, and H. Park 2015). At the workplace psychosocial issues are related to the social factors, work related factors and the work environment.

Occupational Health Hazards

Physical, chemical, biological, ergonomic, and psychological dangers are examples of health hazards. According to former Director-General International Labour Organization (ILO) Juan Somavia, “There has been progress on many fronts in the world of work. But work-related deaths, accidents and diseases, are still major causes for concern. Decent work must also be safe work.”

a. Hazards caused due to Poor Ergonomics

Poor workplace ergonomics is thought to be the root cause of cumulative trauma disorders (CTD), one of the most serious occupational health concerns (OSHA, 1991). Ergonomic risks develop as a result of an inadequately built workplace, repeated activities, uncomfortable

postures, and other factors that cause CTD in the arms, shoulders, lower back, hands, wrists, and spinal area. They have an effect on the muscles, tendons, and blood vessels. Focusing on preventing such hazards will not only benefit the employee and their family, but will also save the organisation money on worker's compensation owing to decreased production and morale. (Ross, P., 1994). Physically demanding occupations such as construction, housekeeping in hotels, textile, woodwork, and metal industries, among others, must place a greater emphasis on workplace ergonomics. Aside from the nature of the job, awkward postures and repeated motions can enhance the worker's risk of acquiring MSDs (Rahman, M. N. A., & Jaffar, M. S. M., 2017).

b. Hazards caused due to Environment of the Workplace

The workplace environment is critical for workers' health since bad conditions, such as exposure to harmful gases and radiation, can lead to problems with crucial organs. If the hazardous environment persists, persons exposed may suffer long-term disease or possibly death (Tulchinsky, T. H., & Varavikova, E. A., 2014). Comfortable temperature, bearable noise levels and adequate lighting will ensure fewer errors and also good health of the workers. Suitable environment will positively impact the overall production at the workplace.

Workers in the Diamond Industry

The availability of low-cost and highly skilled workers is one of the factors contributing to India's thriving diamond sector. The background of the industry's workforce has undoubtedly made a significant influence on its success. The workers' community is humble, religious, and has little formal education. Despite their lack of academic background, these employees have developed excellent managerial and organisational skills (Rao I, 2009). Females are now working in the diamond polishing industry as well. Diamond polishing requires a high level of concentration and attention to detail. It also requires the polishers to sit in an awkward posture for extended amounts of time. The movements are repeated, and the mechanism holding the diamond piece and the eyeglass used to inspect the product's finish are both done by hand. Long working hours with insufficient break time can be harmful to workers' health. The working conditions are more dubious in tiny unorganised units where little attention is paid to occupational health dangers and other issues that workers encounter. Such a working environment aroused the researcher's curiosity, prompting her to investigate the occupational health hazards and concerns encountered by diamond polishing workers.

JUSTIFICATION

There are about 8000 diamond polishing units in Surat, the bulk of which are tiny, unorganised businesses. Numerous thousands of people are employed by this sector, which also makes a significant contribution to India's GDP. This is primarily centred in Surat, India, with a small number of units in Navsari and Mumbai as well. The majority of rough stone is imported by India. Once the rough stone reaches the cutting unit, a software is employed to maximise the value of the stone by imprinting the stone with the appropriate markings. In contrast to the earlier manual process, laser technology is now employed to roughly cut the diamond into the appropriate shape. This cut stone arrives at the polishing unit with information about the required value and weight of the finished gem, which the polishers must take care of. The stone goes through five phases of polishing in the region where its various facets are organised. Every procedure calls for repetitive motions, and the employee must sit in uncomfortable positions for extended periods of time. To handle this pricey piece of stone, which may further inflict a lot of strain, requires high degrees of attention. Therefore, it is crucial to give employees a comfortable workplace that will not only improve their performance but also their health. Since it directly affects the industry's production, the physical and mental health of the workforce is of highest importance. The effectiveness of the workers' labour is also impacted by outside variables like noise, light, temperature, and humidity. Although this line of work entails low to moderate labour, upper body musculoskeletal issues at work may result from static posture and repetitive movements of various body components.

Since there are more small, unorganised diamond polishing businesses than there are large, organised ones, there is a possibility that workers in this field may experience some psychosocial issues at work, which could then have an impact on their mental health both at work and at home. The review of literature revealed that several studies on ergonomic and posture-related issues have been conducted in a variety of Indian industries, including the textile and iron and steel sectors, among others. There was no evidence of research being done in the relevant areas at the chosen location for the relevant sector. This study was conceptualised since the physiological issues, psychosocial issues, ergonomic risks, and physical risks associated with the workplace have not yet been investigated.

The study's conclusions will be useful to the owners of the diamond polishing units since it will inform them of the current condition and direct them in making changes to the workplace. The study will also be useful in educating the industry's workers about the coping mechanisms and

suggesting them comfort enhancing products that can be used for their own welfare. Better performance and high production are directly impacted by such improvements on the part of both the company and the employee. The Department of Family and Community Resource Management lays a lot of emphasis on 'Ergonomics' as a subject to be studied at the undergraduate as well as masters level. The study and its results will be helpful for the students to understand the significant role of occupational environment and ergonomics in making the workplace a safe place for its employees.

Every person has the right to a safe, healthy, and happy workplace, yet this is a crucial issue that many people frequently overlook, particularly in a nation like India where unemployment and illiteracy are high. Many people prioritise having access to two full meals per day, thus occupational health issues frequently take a backseat. The former UN Secretary General Koffi Annan made the excellent point in 2002 that "Safe Work is not only sound economic policy," "it is a basic human right." In the strictest sense, concerns about safety and health ought to be addressed in the rules of any organisation. However, in India, where there are stark differences in values, educational attainment, and cultural norms, these policies serve more as guides than as requirements. Employers and industry authorities alike have a moral and ethical obligation to provide a safe and healthy work environment for their employees without considering the financial return on their investment. The study of occupational health and safety has gained significant importance since a worker spends 8 to 9 hours a day in contact with equipment, substances, and procedures that could be harmful to his health.

The present study is pertinent to the current situation because it is now established that occupational disorders, both physical and mental, have a negative impact on the workers health and happiness. There is no room for industries, employees, workers, or the government to ignore this component in today's time, where the actual meaning of "Health is Wealth" has surfaced.

STATEMENT OF THE PROBLEM

The present study aims to assess the problems and occupational health hazards faced by workers employed in the diamond polishing industry and suggest coping strategies as well as develop comfort enhancing products in order to maintain the mental and physical health of the workers.

OBJECTIVES

1. To find out the background information of the workers employed in the diamond polishing industry
2. To assess the problems faced by the workers at their workplace
3. To analyse occupational health hazards faced by them at work
4. To suggest coping strategies in order to deal with their problems and enhance the mental and physical health of the workers
5. To develop comfort enhancing products to reduce physical health hazards of the diamond industry worker

HYPOTHESES

1. There is no association between independent variables viz gender, age, marital status, education, family type, number of members in the family, number of years in the same field, type of work and physiological problems.
2. There is no significant correlation between Physiological Problems and Psychosocial Problems.
3. There is no significant correlation between Physiological Problems and Occupational Health Hazards.

DELIMITATIONS

1. The study was limited to diamond industry located in Surat city only
2. The study was limited to the diamond polishing process only
3. The study was limited to small units employing less than 50 employees
4. The study was limited to a sample size of 500 respondents
5. The study was limited to those respondents who have been doing the present work for a minimum period of 2 years

REVIEW OF LITERATURE

The chapter on review of literature had two subsections i.e. Theoretical Orientation and Empirical Studies focusing on occupational health hazards and problems faced by people working in various industries.

Theoretical Orientation

This subsection encompassed topics such as Origin and Process of Diamond Manufacturing, Physical Structure of a Diamond and Diamond Industry in Surat and other parts of India.

Empirical Studies

This subsection of the review chapter consisted of research conducted in India as well as abroad on topics such as:

- Physiological problems faced by industry workers
- Psychosocial problems faced by industry workers
- Occupational health hazards
- Coping strategies adopted by industry workers

METHODOLOGY

The objective of the present study was to assess the problems and occupational health hazards faced by the diamond polishers of Surat city, Gujarat, India. Thus a Descriptive Research Design was considered most suitable for the current research.

Sample size and Sampling procedure

Diamond polishing units operating with 50 or less workers were selected using snowball technique. The polishing of rough stones consists of five activities and thus, 100 respondents from each of the activities namely table work, rounding of girdle, athpel, mathala and talia work were selected using the Purposive Sampling Method.

Selection of Tool

For the present research, the Interview Schedule was selected as the tool for data collection. The tool was prepared keeping in mind the objectives of the present study.

Description and Development of the Tool

The interview schedule was prepared in lines with the objectives of the present study. Thus, questions that would help in gathering information to achieve the objective of the study were included.

The interview schedule was divided into three sections:

Section I: This section included questions that would help in getting information regarding the 'demographic profile' of the workers. It was further divided into three subsections. The first subsection had questions related to personal information like name, age, educational qualifications, type of house, migration history etc., the second subsection had questions pertaining to the family details like type of family, number of family members, etc. and the third subsection addressed work related queries like number of years in the industry, type of job, working hours, number of breaks, type of work done, type of seating, time taken to complete a task etc..

Section II: This section aimed at identifying the problems faced by the workers in their workplace and was divided into two subsections. The first subsection gathered information on the 'physiological problems' which was further divided into chronic diseases like hypertension, diabetes etc, respiratory problems like allergy to pollution, shortness of breath etc.,musculoskeletal problems like numbness in hands, joint pain, weakness etc. and other problems related to eye, ear, skin, sleep and eating disorders.

The second subsection aimed at gathering information on the 'psychosocial problems' faced by the workers at the workplace. It collected information on social factors at work, work organisation and the work environment.

Section III: This section assessed the occupational health hazards that the diamond polishers were exposed to namely 'ergonomic hazards' and 'physical environmental hazards'. For assessing the ergonomic hazard modified Nordic Body Map and RULA scale were used. Light, noise, temperature and humidity of the work environment were studied to understand the physical environmental hazard.

Establishment of Content Validity of the Tool

The tool was subjected to the establishment of content validity. The clarity and relevance of the tool was checked by a panel of 11 judges from the field of Family and Community Resource Management as well as experts from the field of Ergonomics. The judges reviewed each statement and also checked the clarity and relevance of each section and sub section. A consensus of 80 % among the judges was taken as a benchmark for the inclusion of the statement in the final tool.

Establishment of Reliability of the Tool

Inorder to check the reliability of the tool, a 'pre testing' was done on a sample size of 30 polishers. The reliability values of the tool were found to be high in all the sections.

Data Collection Method

Data was collected using the Interview schedule method. Small diamond polishing units were contacted through the snowball technique from Surat city and diamond polishers who were willing to participate in the study were interviewed. Purpose of the research was explained to the employers as well as the polishers and they were ensured that the data would solely be used for the purpose of the study. The investigator built a rapport with the respondents and personally interviewed them.

Data Analysis

The data collected was categorized, coded, tabulated and statistically analysed in order to derive conclusions.

Categorization

I Demographic Profile: it was further subdivided into 'background information', 'family information' and 'work related information'.

A. Background information: categorization of the data was done based on the age, gender, category, marital status, educational qualifications, location of stay, type of house, migration history and reason for migration.

a. Age: it was categorized as:
    1. 22-33 years
    2. 34-45 years
    3. 46-57 years

b. Gender: it was categorized as:

1. Male
2. Female

c. Marital Status: it was categorized as:

1. Married
2. Unmarried

d. Educational Qualification: it was categorized as:

1. No formal education
2. Upto middle school
3. Upto high school

e. Location of Stay: it was categorized as:

1. Urban
2. Sub-urban
3. Rural

f. Type of house: it was categorized as:

1. Rented
2. Owned

g. Migration history: it was categorized as:

1. Intercity (within state)
2. Rural to urban (within state)
3. Inter state

h. Reason for migration

1. Better lifestyle
2. Desire to earn more
3. Lack of employment opportunities
4. Others

B. Family Background: categorization was done on the basis of whether the respondents were staying with or away from their family, type of family, number of family members, number of earning members and whether any other family member was employed in the diamond industry.

a. Staying with or away from family: it was categorized as

1. Yes
2. No

b. Type of family: it was categorized as:

1. Joint
2. Nuclear

c. Number of family members: it was categorized as:

1. 1-3
2. 4-6
3. 6<

d. Number of earning members: it was categorized as:

1. 1-2
2. 3-4
3. 4<

e. Whether family members are employed in the diamond industry: it was categorized as:

1. Yes
2. No

C. Work related information: categorization was done under whether the present place is the respondents first job, number of years in the industry, number of years in the current workplace, source of getting the present job and method of learning the present work.

a. Whether it is the respondents first job in the industry: it was categorized as:

1. Yes
2. No

b. Number of years in the industry: it was categorized as:

1. 2-10 years
2. 11-19 years
3. 20-28 years
4. 29-37 years

c. Number of years in the current workplace: this was categorized as:

1. 2-6 years
2. 7-12 years
3. 13-18 years

d. Source of getting the present job: this was categorized as:

1. Self
2. Reference

II Problems faced by the Respondents : it was further categorized into 'physiological problems' and 'psychosocial problems'.

A. Physiological Problems : In this scale, the physiological problems experienced by the respondents that they attribute to their work and workplace was assessed. The respondents were required to answer a 'yes' or a 'no' to each of the given problems. Problems were categorized as:-

1. Chronic problems
2. Respiratory problems
3. Musculoskeletal problems
4. Other problems related to eye, ear, skin etc.

B. Psychosocial Problems: in this scale the respondents were supposed to answer with an 'experienced' or a 'not experienced' to the psychosocial problems experienced by them at the workplace. The problems were categorized as under :

1. Social factors at work
2. Work organisation
3. Work environment

III Occupational Health Hazard: it was further divided into 'ergonomic hazard' and 'physical environment hazard'

A. Ergonomic Hazards: in order to determine the ergonomic hazard two separate tools were used, 'Nordic Body Map' and 'Rapid Upper Limb Assessment (RULA)'.

The Nordic Body Map was used to assess the perceived musculoskeletal pain experienced in 28 different locations of the body. The degree of pain is determined on a scale of 1-4 in which 1 means 'no pain', 2 means 'rather pain', 3 means 'pain' and 4 means 'very painful'. The degree of risk and the improvement needed is determined based on the individual sum of scores as depicted in the table below.

Sr. No.	Individual Score	Degree of Risk	Improvement
1	28-49	Low	Does Not need improvement
2	50-70	Medium	Maybe needs improvement
3	71-91	High	Need improvement
4	92-112	Very High	Need improvement as soon as possible

The Rapid Upper Limb Assessment scale was used to determine the postural load requirements of job tasks on neck, trunk and upper extremities. On the basis of the assessment on the RULA scale, the individual scores of the respondents were calculated and then categorized on the basis of the following:

Score	Level of MSD risk
1-2	Acceptable Posture
3-4	Further investigation,changes may be needed
5-6	Further investigation, change soon
6+	Investigate and implement change

B. Physical Environment Hazard: in order to determine the physical environment hazard different tools were used namely, digital thermo hygrometer (to calculate temperature and humidity), digital lux meter (to measure level of lighting) and digital noise meter (to measure the level of noise).

Coping Strategies

The results of the physiological and psychosocial problems experienced by the respondents were used to suggest coping strategies to them so that these problems may either be totally prevented or may be handled in a suitable and effective manner.

MAJOR FINDINGS

The findings of the present research as obtained after the analysis of the data collected are described as follows:

I Demographic Profile

A. Background Information: it was observed that the mean age of the respondents working in the diamond polishing industry was 35.28 years. The age of the youngest worker was 22 years and the oldest was 57 years. Maximum percentage i.e. 47.4 % of the workers belonged to the age group of 22-33 years followed by 39.4% from the age group of 34-45 years and only 13.2 % from 46-57 years age group. Most of the respondents i.e. 89.6% of them were males and the remaining 10.4% were females. Most of them (83%) were married and 17% were unmarried. Maximum percentage of respondents i.e. 67.2% of them had completed their education upto middle school, 26.8% had completed education upto high school and only 6% had no formal education. Place of stay for 62% of the respondents was in urban areas while the remaining 34% and 4% stayed in sub-urban and rural areas. Out of all the respondents, 61% of them lived in rented houses, while 39% owned their houses. From the 500 respondents 185 had migrated from different places with maximum people (37.8%) migrating from rural to urban areas (within the state) which was closely followed by 35.1% of the respondents coming from other states and the remaining 27% from other cities within the state. The reason for migration as described by 44.3% of the respondents was the 'desire to earn more'. Other reasons reported were 'lack of employment opportunities (27.6%), 'better lifestyle' (15.1%) and 'other reasons' (13%).
B. Family Background: it was observed that 59.4% of the respondents were living with their family and 40.6% were living away from their families. Most of the workers i.e. 60.2% of them had joint families and 39.8% of them had nuclear families. Data revealed that 44.2% of the workers had 4-6 people in their families, 39.4% and 16.4% had more than 6 and 1-3 members in their families respectively. The number of earning members in 48% of the case was 1-2 while it was 3-4 for 46.8% of the respondents. Only 5.2%

had more than 4 members earning in the family.It was observed that 83.2% respondents did not have other family members working in the diamond industry while 16.8% had someone from their family working at the diamond industry.

C. Work Related Information: the information gathered revealed that the present place of work was the first job for 55.6% of the respondents while for 44.4% of them it was not their first job. It was also observed that 42.6% of the workers had spent 2-10 years in the industry followed by 11-19 years (32.6%), 20-28 years (18.6%) and 29-37 years (6.2%). The maximum number of years spent in the industry was 37 years. Number of years in the present place of work was found to be 2-6 years for 46.6% of the respondents followed by 32.6% and 20.8% having spent 7-12 years and 13-18 years respectively. On enquiring the source of getting the present job, it was found that 63.8% got the job through reference while 36.2% got it through self application.

II Problems Experienced by the Respondents

A. Physiological Problems

1. Chronic Problems: it was observed that 60.2% of the respondents, which was the maximum percentage, attributed their chronic problem of hypertension to the present nature of work.
2. Respiratory Problems: the data revealed that 65.6% of the respondents complained of being allergic to pollution and 32.6% of them reported frequent respiratory infections.
3. Musculoskeletal Problems: it was observed that 84% of the respondents and 64.2% of the respondents complained of fatigue and weakness respectively. Numbness in legs and bent back was also reported by 57.4% of the respondents respectively.
4. Other Problems: maximum number of respondents i.e. 80% of them complained of tired eyes. Ear irritation and severe headache were the other problems reported by 68.8% and 55.2% of the respondents respectively.

B. Psychosocial Problems

1. Problems Related to Social Factors at Work: it was observed that the maximum percentage of respondents, i.e. 64%, felt that there is poor communication between coworkers. A similar percentage felt that work hours were not flexible.

Addiction to tobacco and not having good relations with co-workers were other social problems faced by 58% and 56% of the respondents respectively.

2. Problems Related to Work Organisation: maximum percentage that is 80.2% percentage of the respondents felt frustrated at work. Majority of them, 78.2%, also felt that the work was monotonous.The fact that not enough job specific training was being provided and lack of good facilities was felt by 76% and 73.6% of them respectively.
3. Problems Related to Work Environment: inadequate ventilation and uncomfortable temperature was complained by 68.6% and 64% of the respondents respectively. Many of the respondents (61%) found the noise to be irritating. Seats being uncomfortable was also reported by 54.6% of the respondents.

III Occupational Health Hazard

A. Ergonomic Hazard: it was observed that most commonly perceived musculoskeletal pain areas were ‘back’, ‘buttock’, 'bottom’, ‘left shoulder’, ‘left wrist’ and ‘left lower arm’. Data also revealed that pain experienced when doing different activities was maximum for ‘mathala work’ (2.67) followed by ‘athpel work’ (2.54), ‘table work’(2.52) and ‘talia work’ (2.51). Least pain was experienced by workers doing ‘rounding of the girdle’ (1.93).

The level of risk calculated based on the perceived musculoskeletal pain is as follows:

Sr. No.	Level of risk	Range of Score	Distribution of the respondents (n=500)	
			f	%
1	Low	28-49	31	6.2%
2	Medium	50-70	231	46.2%
3	High	71-91	232	46.4%
4	Very High	92-112	6	1.2%

From amongst the respondents experiencing more musculoskeletal pain, 50 respondents were selected to assess their postural discomfort. Video recordings and photographs of the respondents were taken to study the ergonomic postural analysis.

The level of MSD risk based on RULA scale is depicted as follows:

Sr. No.	Level of MSD risk	Range of Score	Distribution of the respondents (n=50)	
			f	%
1	Acceptable Posture	1-2	7	14%
2	Further investigation,changes may be needed	3-4	7	14%
3	Further investigation, change soon	5-6	25	50%
4	Investigate and implement change	6+	11	22%

B. Physical Environmental Hazard:

1. Indoor Light Levels: it was observed by the investigator that most of the units had limited access to natural light and therefore they relied on artificial lighting inside the work space. A lux meter was used to record lighting levels inside the 15 units, of which 3 units had lesser than the recommended level of lighting at the machine. While the general level of lighting was found to be appropriate in all the units.
2. Indoor Noise Levels: the reading on the Digital Sound Meter revealed that the average noise recorded in all the units during the peak working hours was 87.33 db which was within the recommended level of noise (85db-90db) by OSHA.
3. Indoor Temperature and Humidity: a digital thermo hygrometer was used to record the temperature inside the polishing units. The data showed that the mean temperature recorded in all the units was 31.02℃ and the humidity ranged from the lowest of 34% to the highest being 44%.

IV Testing of Hypotheses

Relational Statistics Applied to Test the Hypotheses

Tests	Variables
Significance Test of Correlation Coefficient	Physiological Problems And Psychosocial Problems
	Physiological Problems And Occupational Health Hazards
Kruskal Wallis H Test	Gender, Age, Marital Status, Education, Family Type, Number of Members in the Family, Number of Years in the Same Field, Type of Work **With** Physiological Problems
	Gender, Age, Marital Status, Education, Family Type, Number of Members in the Family, Number of Years in the Same Field, Type of Work **With** Psychosocial Problems

The findings of hypotheses will be discussed in the thesis at the time of submission.

Section V Coping Strategies to Deal with Problems

The process of diamond polishing can be a physically and mentally taxing activity that demands accuracy, precision and close attention to detail. Based on observations as well

as the information collected, the researcher has suggested the following coping strategies that can be employed by diamond polishers to reduce both physical as well as mental stress and maintain productivity in their work:

Coping Strategies to deal with Physiological problems:

- In order to prevent and cure chronic diseases at an early stage, the workers must get regular health check ups done. For this the employer should take medical policies for their employees.
- To avoid problems related to being allergic to pollution, the design of the working unit must be such that it has good ventilation. Cross ventilation is ideal for such workspaces, but in places where that is not possible, artificial ventilation techniques like providing exhaust fans at strategic locations will be beneficial.
- For the workers who experience shortness in breath, breathing exercises before, during and after the completion of their work can prove to be very useful.
- Since the majority of the workers experienced fatigue, regular short breaks throughout the day will bring a significant reduction in this problem. For a work shift of 8-10 hours, two half an hour breaks are recommended while a 4-5 minute break must be taken after every 11/2 hour or as an when needed by the worker.
- Diamond polishers are sitting in static posture for a long time and also bent a little towards the polishing machine. This may result in bent backs which can be extremely painful and in the long run may also lead to irreversible posture distortion. The employers must train and make the employees aware of the correct postures to maintain through their work hours. Putting up posters of such reminders may also be helpful. Making exercise a part of a daily regime can also have a preventive as well as curative impact on this problem. Simple exercise including back and shoulder stretches during the breaks will contribute significantly to resolving this problem.

Coping Strategies to deal with Psychosocial problems:

- The data revealed that many of the workers felt that there was poor communication between the coworkers. The workers must be encouraged to

keep an open communication among them. A culture of good interpersonal skills should be developed and the employer must play a pivotal role in doing so. Effective grievance handling, unbiased supervision and pay parity are some of the ways in which this can be achieved.

- The employees also felt that the work hours were not flexible and again the role of the employer becomes important here. Policies that provide time flexibilities to the workers should be made for the convenience of the workers.
- Monotony in the work being performed was another problem experienced by the workers. Playing light instrumental/devotional music and adequate breaks in between will help in refreshing the workers to perform their work.
- The workers also thought that not enough training was being provided to them. The employer must design a suitable induction training program for new employees and sometimes also for those with previous experience. Such programs will contribute significantly to improving the performance of the workers and will also motivate them to achieve their goals.

Other Coping Strategies:

1. Staying Hydrated: Consuming enough liquids throughout the day can help in increasing focus and alertness of the workers, which in turn will reduce errors and increase productivity.
2. Eating Healthy: eating healthy, nutritious and hygienically prepared food will have a positive impact on the overall health of the workers and reduce problems faced by them at the workplace. Eating healthy does not only mean the inclusion of nutritious food but also means following proper eating schedules and portion control.
3. Restraining from substance abuse: drinking alcohol, smoking cigarettes, consuming tobacco or other forms of drugs will not only have a detrimental impact on the health of the workers but can also be a leading cause of problems related to psychosocial work environments.
4. Meditating: including any form of meditative activity like yoga or reading spiritual books etc. can be made a part of daily routine. Such activities increase

mindfulness which aids in increasing concentration and also reduces stress. It also helps in building a positive attitude that makes the interpersonal work relations and the overall work environment positive.

5. Adopting appropriate postures: sitting for long hours in wrong postures will not only reduce productivity but may also cause irreparable damage to the body causing extreme pain and discomfort. Thus the workers must consciously try to maintain correct postures of the back, shoulders, neck etc. to reduce the strain on the respective muscles.
6. Using protective equipment: while working in an industry, it is advisable to use protective equipment to protect oneself from the hazard that the industry possesses. In diamond polishing some simple protective devices can be used; like wearing a uniform made of lightweight cotton breathable fabric that will provide relief from the hot humid conditions of the small setups. Similarly using a posture corrector or back support as well as ear plugs to protect from the constant humming sound can also prove to be beneficial.
7. Maintaining positive attitude: a positive attitude can go a long way in providing the much needed job satisfaction at work. Sometimes the workplace can become monotonous and stressful leading to negative impact on the work as well as interpersonal relations at work. If a person is capable of maintaining a positive perspective and drive towards work then it can bring about a huge impact.
8. Seeking support: talking about problems and issues at the workplace to seniors/employers and colleagues can prove to be very rewarding as a number of difficulties and obstacles can be nipped in the bud itself. Sorting out differences through open dialogue can prove to be very healthy for the work environment as well.

Guidelines for the Employer

1. Train the workers for their specific work
2. Use sound absorbing material in the interior space in order to muffle the noise produced by the machines

3. Create awareness regarding safety at workplace and adopting correct postures by talking to the workers and also using tools like posters
4. Provide adequate duration of breaks to the workers so that they may relax their tired muscles
5. Provide basic facilities like drinking water and clean toilets inside the premises

Section VI Comfort Enhancing Products

1. Ergonomically designed Floor Seat
2. Ergonomically designed cushioned seat with backrest for high tools
3. Foot rest for those sitting on high tools
4. Ear muffs
5. Awareness creating posters

The details and description of the products will be discussed in the thesis at the time of submission.

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