CHAPTER II
REVIEW OF LITERATURE

Literature available on a particular topic is very useful information for a researcher as it provides better clarity regarding the subject matter with the present research problem. It also helps in avoiding doing work that has already been undertaken in the past. Earlier findings that are relevant to the current topic can be synthesized to provide relevant information through an exhaustive evaluation of the literature. Thus a survey of literature was undertaken in order to investigate any prior studies that have been done on the problems and hazards faced by the diamond polishers. The primary source from which the data was collected were scholarly articles, books, journals, websites and other resources. Review of literature was beneficial to understand the importance of the research problem, to understand the methodology used in similar areas of past research and to identify the unexplored areas. For a clear and better understanding of the review, the present chapter is divided in the following subtopics:

2.1. Theoretical Orientation

- 2.1.1. Origin and Process of Diamond Manufacturing
  - 2.1.1.1. Making of Rough Stones
  - 2.1.1.2. Process of Converting Rough Stones to Sparkling Diamonds
  - 2.1.1.3. Detailed Description of Diamond Cutting and Polishing Process
- 2.1.2. Physical Structure of a Diamond
  - 2.1.2.1. Parts of a Diamond
  - 2.1.2.2. 4 C's of a Diamond
- 2.1.3. Diamond Industry in India
  - 2.1.3.1. Growth of the Surat Diamond Industry

2.2. Empirical Studies

- 2.2.1. Studies Related to Physiological Problems Faced by Industry Workers
- 2.2.2. Studies Related to Psychosocial Problems Faced by Industry Workers
- 2.2.3. Studies Related to Occupational Health Hazards in Industries
- 2.2.4. Studies Related to Coping Strategies adopted by Industry Workers
- 2.2.5. Studies on Diamond Industry

2.3. Conclusion of Review of Literature

2.1. Theoretical Orientation

In this section, theoretical information pertinent to the different aspects of the study is described. It provides a structured set of concepts and presumptions that offers the researcher a place to begin organizing the thoughts while conducting research and writing. The theories that are relevant to the inquiry are also discussed and explained in theoretical orientation. In the following description, general information related to the diamond industry has been covered.

2.1.1. Origin and Process of Diamond Manufacturing

A diamond is one of the most beautiful and precious items found on earth. The journey of diamonds starts hundreds of miles below the earth's surface where carbon crystals are exposed to severe heat and pressure and form into rough diamond stones.

2.1.1.1 Making of Rough Stone

The making of raw diamond stones or rough stones starts miles below the earth's surface. It is much different from what it would look like after undergoing the cutting and polishing process. Carbon is the only element found in a diamond crystal. There may be very minute amounts of trace components of other things. These traces of substances are what can determine the hue of diamonds. The intense heat and pressure found deep under the earth promote the fusion of carbon atoms into a highly particular structure. Crystals then develop as they swiftly cool and are referred to as rough or unpolished diamonds. These stones are pale in color, look greasy and lack lustre. The rough diamonds may find one of the two uses - as a gemstone or for industrial use. Usually the lightest color or colorless stones pass the test to be used as a gemstone [(24)].

Rough diamonds are located deep below the earth's surface and can be obtained through the process of mining. It is extremely rare to locate stones on the earth's surface. Although rough diamonds, quartz and even colored glass look relatively similar, the easiest way to locate the valuable stone is through scratch test. A rough diamond is fake, if it can be scratched by something other than another diamond [(24)]. Rough stones occur in shapes that form naturally under the earth's

crust. Some shapes that are found are octahedral (eight sided), cubic and triangular [25].

2.1.1.2. Process of Converting Rough Stones to Sparkling Diamonds

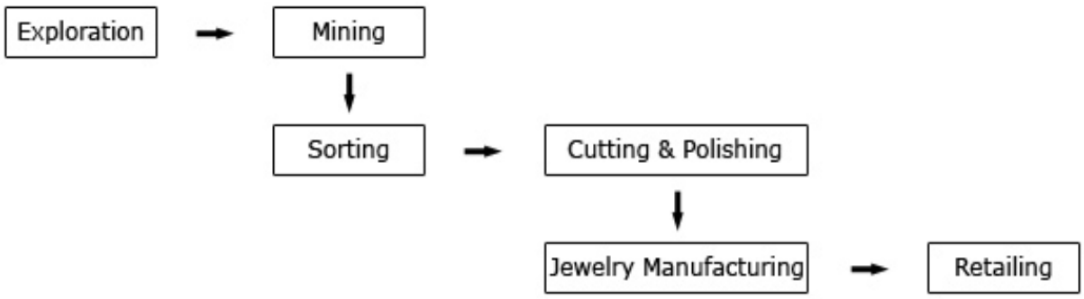


Plate 1: Diamond Process Flow Chart [4]

The process of diamond manufacturing is as follows [4]:

Exploration: The carbon crystals that convert into diamonds under the earth's surface over billions of years sometimes are forced up through the pipes or openings during volcanic activities. Most of these stones then settle back into the kimberlite rocks inside the pipe. On locating diamonds near the earth surface, the explorers get a hint of finding this precious stone deeper below the surface. Diamonds are found in many locations around the world and 80 per cent of the world's diamond supply comes from Australia, Canada, Democratic Republic of Congo, Namibia, Russia and South Africa.

Mining: regions that are discovered for its diamond reserves are mined to extract this stone. Mining may be done under the earth's crust as well as under the seabed.

Some of the methods used for mining are as follows:

a. Open-pit mining: when deposits of the stone exist near the earth's surface then excavating or making an opening is enough to extract diamond.

b. Underground Mining: in this method underground rooms are carved out that are supported by timber pillars. Gems and other minerals are then mined.

c. Marine Mining: when diamonds are excavated from seabed, then it is called marine mining. With the advancement in technology, marine mining has become more common.

d. Artisanal Mining: sometimes, communities, families and even individuals use basic tools and equipment to mine for diamonds. This non-industrial method of diamond mining is called artisanal mining.

After extraction, rough diamonds are separated out from the ore. It is estimated that approximately one carat of rough diamond is produced from 250 tons of ore.

Sorting, Cutting and Polishing: the mined stones are sorted according to the size, color and quality, after which the cutting of the stones is done very carefully with very well trained hands. The main aim of diamond cutters also called 'lapidarists' is to get big pieces of diamonds. They may spend days and months together studying a diamond before cutting it. Diamonds may be cut either by cleaving which is a traditional process and rarely used in today's time or by sawing which is done by the use of copper blade or else by grinding in which diamond is pressed against a spinning steel wheel. Cutting of diamond needs to be done very carefully along the cleavage line taking care of any impurities. The diamond may be of different cuts with different numbers of facets. Some common cuts are Brilliant, Emerald, Marquise and Pear.

Manufacturing and Retailing: Once the diamonds are cut and polished it is exported to the registered diamond bourses around the world where these precious stones are set into beautiful jewellery pieces. The final jewellery pieces are sent to the wholesalers and lastly they are sold to customers by the retailers.

2.1.1.3 Detailed Description of Diamond Cutting and Polishing Process

The process of diamond cutting and polishing is one that gives this stone a shape and converts it onto a beautiful gem. Expert knowledge and specialized tools are required to make this process successful [(26)]. In India the diamond cutters and polishers are called the '*hira karigar*' and the spinning wheel used for polishing the diamond is called '*ghanti*'. Once the rough diamond reaches the unit, the stones are sorted according to size, shape and whether it is makeable or sawable. If the diamond is makeable it is directly sent for cutting and polishing and if it is sawable it is first cut into two or more pieces before being sent for cutting and polishing. Sawable diamonds are marked in the planning department and with the help of a laser it is split into smaller pieces. Makeable diamonds

are sent to the planning and marking department where the planner decides the physical structure of the diamond.

Before cutting the diamond it is important to determine the shape of the diamond that is desired and also take care of the quality of the cut. Diamonds are the hardest material on the earth's surface. Although lasers are sometimes used in the cleaving and bruting process it is largely diamond dust and diamond edged tools and equipment that are used to cut this stone.

Steps in Diamond Cutting and Polishing:

Planning and Marking: the first step in transforming the rough stone into a sparkling diamond can be a time consuming process. This is a very important step as the value of the final product depends upon how well this process has been done. Planning is done with the help of computer software in which the cutter finds out the best possible shape and size of the diamond with minimum waste and maximum output (Plate 2). After this the diamond is marked using laser technology. It is an important step because even a minute mistake may have a great impact on the quality of the diamond.

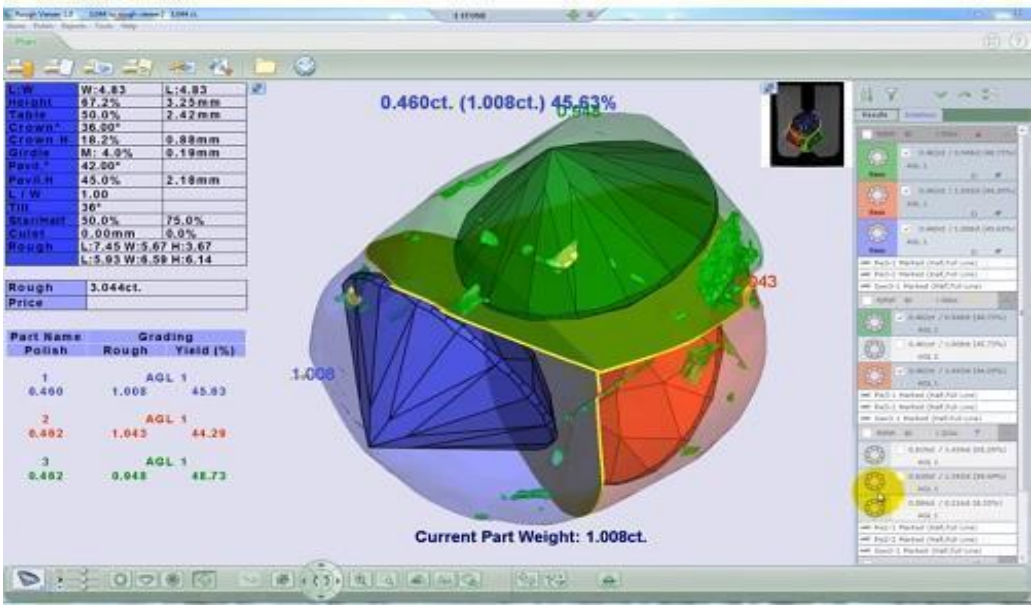


Plate 2: Computer Software used in the Planning Stage [26]

Cleaving and Sawing: in the cleaving process the marked stone is split into separate pieces. Sawing is also done at this stage which is usually a mechanical process (Plate 3). The stone is rubbed against a copper wheel that is covered with diamond dust and

is cut along the marking. In case the rough is of an odd shape then laser cutting tools are also used.

Plate 3: Sawing of Rough Diamond using a Copper Disc [26]

Bruting: in this process the split diamond pieces are rounded using a mechanical process. This is also called girdling (Plate 4). In this process two diamonds are placed opposite each other on a spinning axle. They are then rotated in opposite directions which leads to their grinding against each other to create a rough finish. Earlier bruting was done manually but now it is done using the 4P machine. In the 4P machine laser is used to make the table, girdle, crown and pavilion. Units that cannot afford the 4P machine use 2P machines in which diamond is rubbed against another material that is covered with diamond dust. 4P machines can brut approximately 700 pieces of diamond in 24 hours as compared to 200 pieces by 2P machine.

Plate 4: Process of Girdling or Mechanical Bruting [26]

Polishing: it is the next stage where the diamond gets its final shape. The diamond is fitted on an arm like device and is then rubbed against a spinning wheel to give it a polish. This creates facets on the surface and provides it with a shine.

Plate 5: Diamond Polishing Machine [27]

The polishing process of brilliant cut diamond has five steps:

(i) Table Work- the first step involves polishing the table (1 facet) or the topmost facet of the diamond. The stone is rubbed against a spinning wheel that is at a low height and the polisher is required to sit on the floor cross legged. This is done to avoid the diamond from snipping and falling off. A hand held device locally called '*angoor*' that has a holder called the '*katori*' is used in which the diamond is fitted.

Plate 6: Polishers working on '*ghanti*'

(ii) Girdle Rounding- the second step is a computerized and automated process where the diamond is fitted on a machine that rotates it at high speed. The process is displayed on a monitor on which the polisher controls it and gives shape to the diamond. The girdle is the broadest part of a diamond that is rounded in this process. During this process the polisher sits on chairs with a backrest.

(iii) Talia/Bottom Work- in the next step the diamond is thoroughly checked and fitted in a diamond holder that is fitted on the '*angoor*'. The polisher then polishes the 24 facets of the pavilion of the diamond by holding it against the spinning wheel. This is also called the *talia* work or bottom work.

Plate 7: Rough Stone Holder **Plate 8: Hand Held Device called '*angoor*'**

(ii) Athpel work - after the bottom work, the diamond is handed over to another polisher who polishes the 8 facets of the crown that is called the *athpel*.

(iii) Mathala work - once the *athpel* work is completed, the top 24 facets called the *mathala* are then polished.

The polishing machine (*ghanti*) is at a height and thus the *talia* work, *athpel* work and *mathala* work polishers are required to sit on high plastic or wooden tools that are without backrest.

Final Inspection and Quality Control: once the diamond polishing process is completed it is thoroughly checked to make sure the specifications are accurately met with. If the quality control standards are not met then the stone might be sent to the polisher again

2.1.2. Physical Structure of a Diamond

The value of a diamond is determined by a number of factors, including its size, color, clarity, and cut. It is also important to know about the different parts of a diamond.

2.1.2.1. Parts of a Diamond

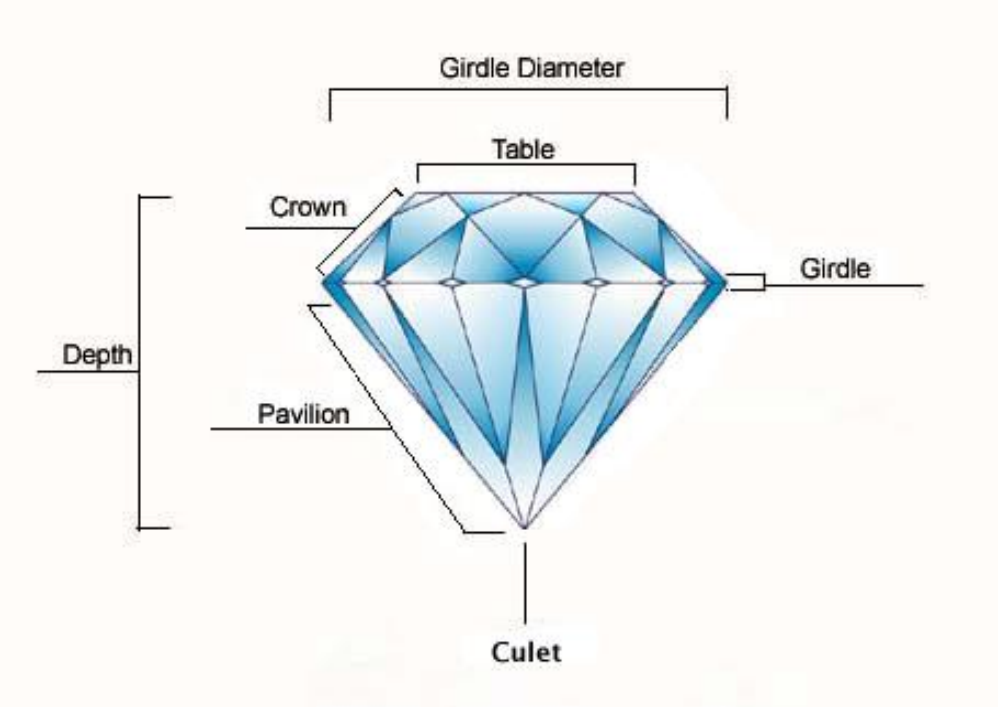


Plate 9: Physical Parts of a Diamond [(28)]

Following are the different parts of a brilliant cut diamond [(28)]:

Table: this is located on the top of the diamond and is the largest facet. The light enters and exits the diamond from here and the light entering the table is reflected on other facets as well. Stones like emeralds have a large table which increases its brilliance.

However, stones with large top facets need to have great clarity since inner inclusions in the diamond can be easily seen.

Facet: the smooth edges on a diamond are called a facet. Good quality diamonds have symmetrical facets which add to its shine. Apart from the table, other facets in a diamond are as follows:

- Star: in brilliant cut diamonds these facets connect to the table and create a star shaped effect.
- Kite: this facet connects the girdle to the table facet
- Girdle: girdles can be very small facets that connects any other facets to the table
- Pavilion: these are elongated facets that connect the centre of the girdle to the bottom of the diamond.
- Culet: they are in diamonds that have a pointed tip at the bottom. Certain types of cuts like princess and radiant do not have a culet.

Crown: the portion that is above the girdle including the table is called the crown of a diamond. Crowns may be high or small depending upon the type of cut.

Girdle: the widest point of the diamond is called a girdle. Some diamonds have girdles that are non-existent while others may have tiny facets on them. The ideal girdle thickness in good quality diamond should be from very thin to thick. Very thick girdles are not desired as they affect the quality of the stone.

Pavilion: the portion of the diamond below the girdle is called the pavilion. It may be deep or shallow depending upon the cut.

Other Important Terms [28]:

Depth: the measurement in millimetres from table to the culet is called the depth of a diamond.

Girdle Diameter: the measurement of the diameter of a girdle in millimetres is called girdle diameter. It is the widest point of the diamond.

Symmetry: the quality of the facets, their cut, shape and arrangement determine the grade of the diamond and is called its symmetry.

Polish: Polish is the finish of the outer surface. There should not be any polish lines, scratches and pits. The brilliance, grade and value of the diamond will be affected if it has poor polish.

Finish: the final grade of the diamond will be affected by its finish, which is the total assessment of the polish and symmetry of the diamond.

Leakage: areas in a diamond that absorb light instead of reflecting it back are those that have leakage. Lesser the leakage better will be the brilliance and fire of the stone. Poorly cut diamonds may display the leakage properties.

Bow-Tie Effect: sometimes, when looking straight down the diamond a shadowy area resembling a bow-tie may be noticed. Bow-tie effect is greatly reduced in diamonds that have an excellent cut.

Scintillation: this is one of the highly valued characteristics of a diamond. It is the sparkle displayed when the stone is in motion. Cuts like brilliant, princess and marquis exhibit a good amount of scintillation. Scintillation is called ‘flash’ when the sparkle is white and it is called ‘fire’ when the sparkles are colored.

2.1.2.2. 4 C’s of a Diamond

The 4 C’s, namely cut, color, clarity and carat are very important to understand and judge the value of a diamond.

Cut: The "Cut" of a diamond is possibly the most significant factor that affects its beauty. Diamond cut especially relates to a diamond's angles, dimensions, symmetrical facets, brilliance, fire, scintillation, and finishing touches. These elements have an immediate effect on a diamond's potential to sparkle as well as its general visual attractiveness. Diamond cut is usually graded on a scale of Poor, Fair, Good, Very Good and Excellent [(29)].

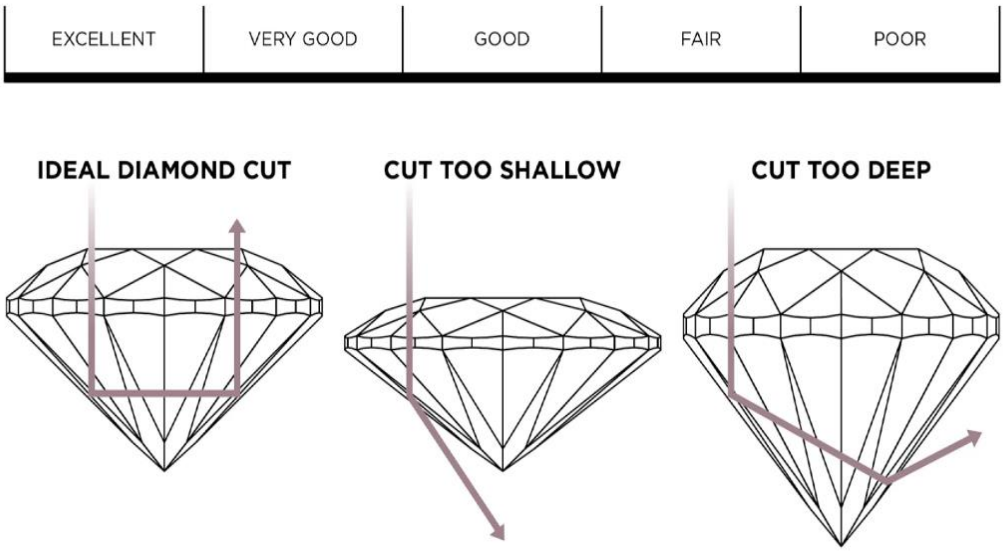
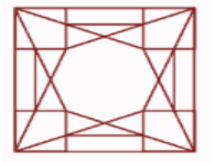
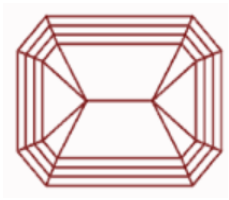
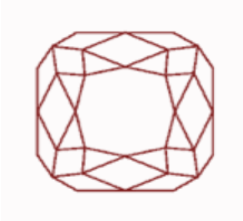
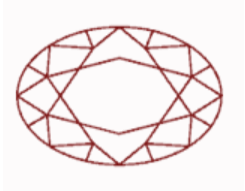


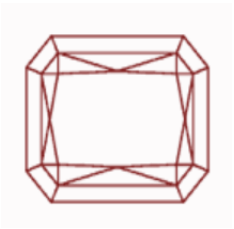
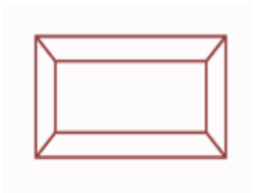
Plate 10: Different Cuts of Diamond [30]

Apart from the most precious round cut diamonds, there are many other fancy cut diamonds in the market. The final shape of a diamond depends on the original shape of the rough diamond.

Table 1: Some Common Shapes of Diamond [31]

	**1. Round Brilliant Cut Diamond** This cut is an evergreen choice for diamonds that give an ageless and classic look to any piece of jewellery.
	**2. Princess Cut Diamond** This shape resembles a square shape and offers a similar brilliance as a round brilliant cut diamond but is much lower in cost as compared to it.

	**3. Emerald Cut Diamond** This cut looks larger in size as compared to other other shapes of the same carat and thus it is a choice for those desiring large diamond pieces without paying huge prices.
	**4. Cushion Cut Diamond** This cut gives a luxurious appeal and offers personalization.
	**5. Asscher Cut Diamond** It is similar to emerald cut but is more sparkling because of the high crown and 58 facets.
	**6. Pear Shaped Diamond** This shape of diamond is hard to find and is an exquisite alternative to the traditional cuts.
	**7. Oval Diamond** They look similar to round diamonds but have a lower price. It is also more durable as this shape has no pointed edges.

	**8. Heart Shaped Diamond** This cut requires a premium cut and therefore has high value.
	**9. Radiant Cut Diamond** This cut has bevelled corners that bring more stability to it. It gives an appearance of cracked ice because of many facets at different angles. This is the reason why flaws are easily hidden in this cut.
	**10. Marquise Diamond** This is an elongated longer stone compared to other cuts of the same weight. It has a high shine and attractive shape.
	**11. Baguette Diamond** The symmetry and clarity of this cut is very attractive and makes it timeless and classic.
	**12. Trillion Diamond** This cut looks larger than other shapes of the same weight. The cut looks very appealing and it has good width.

Colour: Diamond color is determined by examining the stone under controlled lighting conditions, and comparing it to a set of master stones that represent different points on

the color grading scale. This process is typically performed by a certified gemologist or diamond grading laboratory [29].

Plate 11: Color Grading of Diamond [32]

Although diamonds with light tints are not visible to the naked eye, ideally a diamond should be colourless. The Gemological Institute of America has graded the colour of the diamond alphabetically. Alphabets from 'D' onwards is allotted to diamonds that are totally colourless and the grade goes upto 'Z' which is for diamonds that are heavily tinted. Slightly tinted diamonds can also look beautiful if they have good clarity and symmetry. From 'S' onwards the tint becomes more and more intense. Naturally occurring diamonds come in shades of a rainbow like pink, blue, brown, green, orange and red. These colored diamonds are extremely rare and valuable, and are graded on a separate scale known as the fancy color grading scale [29].

Clarity: Clarity refers to the quantity and visibility of the flaws inside the stone.

Plate 12: Clarity Grading of Diamond [32]

FL- diamond that are completely flawless

IF- diamonds that do not have internal flaws. They have external flaws that can be removed with further polishing.

VVS1-VVS2- these flaws are only visible to an expert under 10x microscope. The very slight flaw may be visible from the top of the diamond where it is called VVS2, and if detected from the bottom, it is called VVS1.

VS1-VS2- flaws are visible under 10x microscope but they are very slightly included and thus it takes time to identify the flaws.

SI1-SI2- flaws are readily seen under a 10x microscope.

I1-I3- when a diamond is given this grading then the flaws are eminently visible and can be seen through the naked eyes.

Carat: The weight of a diamond is measured in 'carat', as its unit of measurement. A carat denotes 200 milligrams and thus a 5 carat diamond would weigh 1 gram. Thus the word carat is specifically used for the weight of the diamond, unlike the common understanding of the term being referred to the size of the stone [33].

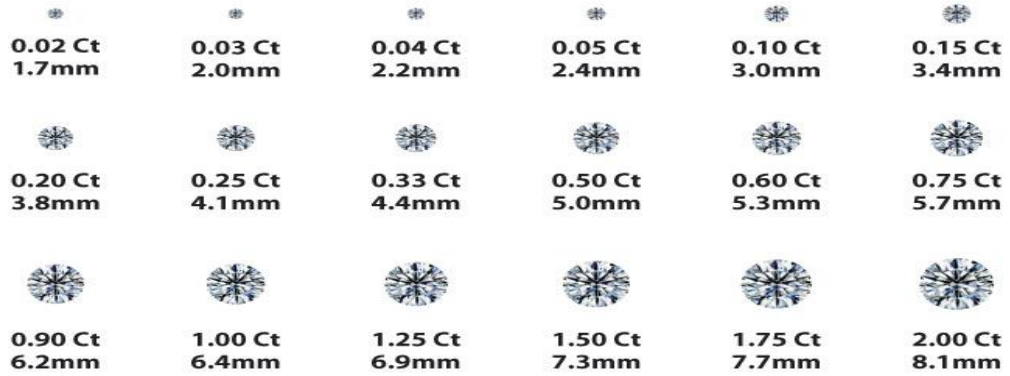


Plate 13: Diamond Carat Weight Chart (Approximate values) [33]

2.1.3. Diamond Industry in India

Diamond mining in India has been done since eternity. Before diamond reserves were found in South Africa in 1986, it was only India that was producing diamonds. Many of the world famous diamonds trace their origin to India. Although after the 1900s India has not been producing a lot of diamonds, the process of mining still continues [34].

In the year 2020, India produced 28 thousand carats of diamond which was the second lowest as compared to the production of the last nine years. In Asia, India is the only country that is mining diamonds and this mining is done mostly in the state of Madhya Pradesh [35].

At present the Panna region in Madhya Pradesh is an industrial scale diamond mine in India. Mining here is done using an open pit method. The mine is owned

by National Mineral Development Corporation (NMDC) and it employs 199 people. It started operating in 1967 and since then it has yielded million carats of diamonds and continues to do so. Here plots of size 8x8m are leased to individuals and if they find any diamond then it is handed over to the government. After deducting taxes and 11.5 per cent government royalty the remaining sales proceeds are given to its finders. As per the data of 2016, 952 such artisanal mines that yielded 835 carats of diamonds were officially present in the region [(34)].

Even though India is not amongst the leading producers of rough diamond, it is the leading exporter of finished diamonds. It is said that 11 out of 12 diamonds around the world are polished in India. Most of this sector is unorganised but still 80 per cent of the world's polished diamonds come from India [(36)]. Also, 80 per cent of the polishing work is concentrated in Gujarat and within this region, Surat houses 90 per cent of the diamond cutting and polishing companies. Earlier India was processing small stones of size less than a carat, but as business grew and technology entered this sector, stones of size ranging from 1 to 5 carat also started being cut and polished in the country. Although the top quality stones were earlier cut in Antwerp, New York and Tel Aviv, now they are being processed in India, especially in Surat. Apart from Surat, over hundreds of units have been set up in tribal areas like Jhankhvav, Mandvi, Vankal, Ahwa, Dang and around Nandurbar area in Maharashtra. This industry is a source of employment to the men as well as the women in these regions [(37)].

In India the diamond cutters and polishers are called the '*hira karigars*' and the spinning wheel used for polishing the diamond is called '*ghanti*'. Once the rough diamond reaches the unit, assortment of the diamond is done according to size, shape and whether it is makeable or sawable. If the diamond is makeable it can be sent directly for cutting and polishing and if it is sawable it will be first cut into two or more pieces before being sent for cutting and polishing. If the diamond is sawable then it is first sent for marking in the planning department. Marking is made on the diamond from where the diamond will be later split with the help of a laser. If the diamond is makeable it will be sent to the planning and marking department. In this process the planner decides the structure of the diamond and placement of table, girdle etc. Planning and marking of the diamond can be done

either manually or with the help of software. In either of the ways the main objective is to get the maximum output in terms of price. When software is used for planning, then a laser marker in the machine marks the diamond. Once the diamond is taken out of the machine, it already has markings on it and along with it a label is also generated that gives the specification of the final product, for example, crown angle, pavilion angle etc. From here the diamond reaches the shaping and bruting department. The bruting department is responsible for developing a girdle in the diamond and thus creating the typical top shape of the diamond. Earlier bruting was done manually but now it is done using the 4P machine. In the 4P machine laser is used to make the table, girdle, crown and pavilion. Units that cannot afford the 4 P machine use 2P machines in which diamond is rubbed against another material that is covered with diamond dust. 4P machines can brut approximately 700 pieces of diamond in 24 hours as compared to 200 pieces brutted by 2P machine. After this process the diamond is sent for cutting and polishing where the facets are created and polished to give it a shine. First, the table is cut and polished. After this either the pavilion will be cut which is called the '*talia*' or crown will be cut which is called the '*mathala*'. This is done by putting the diamond on a hand held device called the tank or '*angur*' in local language, and then rubbing it against the spinning wheel. Lastly, shine is given to the girdle with the help of a rounding machine. Girdle can be either faceted, bruted or polished [(38)].

2.1.3.1. Growth of the Surat Diamond Industry

The history of polishing diamonds in Surat dates back to the year 1901 when a merchant bought a group of diamond cutters from East Africa to Surat. These diamond cutters were not only involved with production but also trained the locals in this art. But the actual growth took place somewhere around the 1960s when a few businessmen belonging to the Patel community started importing rough diamond and exporting polished diamond. Gradually the industry started growing in leaps and bounds and with the favourable environment brought by the economic reforms in 1991, there was no looking back. The proximity of Surat to Mumbai was another favorable factor that contributed towards the successful establishment of this industry [(39)].

In India, Surat and Mumbai are among the few cities in the world that have well established diamond cutting and polishing units. Other cities are Antwerp (Belgium), Ramat Gan (Israel) and New York (USA). Several small towns around Surat like Navsari, also have well established diamond polishing industries. With the establishment of the Indian Polishing industry there has been a sharp decline in the units of Antwerp and Ramat Gan. Although these places utilize top technology and also produce high end stones, 70 per cent of the diamonds are still cut and polished in the Indian industry due to the cheap and easy availability of labour. According to the latest reports the value of Surat's diamond market is 1.8 lakh crore and it employs over half a million people across 6000 polishing units [(40)]. This industry is largely located in Surat's Varachha Road, and most of the units are located near Sardar Chowk in Varachha.

2.2. Empirical Studies

This section consists of the various studies done in India as well as outside India related to the problems experienced by workers of the diamond polishing industry as well as other industries. The section also covers studies on the occupational hazards namely physical and ergonomic hazards that the employees are exposed to.

2.2.1. Studies Related to Physiological Problems Faced by Industry Workers

Mahmud et. al. (2018) conducted a study in the readymade garment industry of Bangladesh. They conducted a survey amongst 360 women workers of the industry to understand the physical and physiological health hazards faced by them due to poor work conditions and laborious job. They concluded that due to the type of work, poor postures, noise, dust and other physical hazards, 88 per cent of the women were suffering from headache, 75 per cent of them suffered from hand pain and 55 per cent of them experienced respiratory complications. The fear of accidents was determined as the reason for psychological problems leading to 69 per cent of the respondents experiencing depression.

Deb et. al. (2018) undertook a study in the footwear industry of Bangladesh with the objective to study the physiological problems experienced by the workers due to the nature of their work. Data was collected from more than 400 workers and supervisors from 20 footwear industries in Bangladesh. It was observed that frequent headache, stomach ache, eye problems and joint pains were experienced by the respondents along with respiratory, ear and skin problems as well as coughing. The researchers observed that personal protective equipment was not being used by most of the respondents and most of the industries did not maintain adequate lighting and temperature needs. Noise was a problem in many of the industries and workplace hygiene was also compromised to a great extent. The study reported that these problems were causing the workers to leave their jobs and look for better options. The researchers concluded that use of safer chemicals and technology can help in overcoming chemical as well as ergonomic risks.

Priyanka & Kamble (2017) conducted a study on the street sweepers of Chandrapur city to analyse their exposure to dust and other contaminants while cleaning the streets. The researchers selected twenty workers (10 male and 10 female) in the exposed group and 10 workers (5 male and 5 female) in the control group. The study was carried out over a period of three months and Breath-o-meter was used as a tool to analyse the Peak Respiratory Flow Rate. The data revealed that the Peak Respiratory Flow Rate was much lower in the exposed group as compared to the control group. The respondents from the exposed group suffered from musculoskeletal disorders (100 per cent), respiratory problems (95 per cent), skin problems (90 per cent), headache (75 per cent) and gastrointestinal problems (15 per cent). Other problems observed amongst these workers were that they suffered from allergies, cold and cough, asthma, hearing problems, fever, vomiting, malaria and typhoid after their work was completed. The researchers thus suggested that in order to protect the workers from these health risks, apart from raising their awareness it is important to encourage them to use personal protective equipment.

Padmini and Venmathi (2012) conducted a study on the garment industry workers of Tirupur that is located in Western Tamil Nadu in South of India. The objective of the study was to detect unsafe environment in this industry and also assess the safety measures that are practiced. To fulfil this objective 514 workers

employed in 13 small to large scale industries were selected. Detail was collected by using face-to-face confidential interview schedules. Information regarding their socio-economic background, personal habits, knowledge, attitude, practices, discomfort at work and other health problems was collected. The results from this information was then analysed and it was revealed that the workers of the garment industry were facing a lot of problems at work due to congested workplaces, poorly designed and non-ergonomic work stations, improper ventilation, too much noise, dust and not using personal protective equipment. Lack of education and awareness about hazards and also general backwardness adds to the exposure to occupational health hazards. The researchers thus suggested that educating the workers, making them aware about occupational health and safety and motivating them to use personal protective equipment will help in achieving a safe and healthy work environment.

Manjunatha et.al. (2011) conducted a cross sectional study among the iron and steel workers to study their health status and to identify occupational health hazards. Stratified random sampling technique was implemented and a structured pre-tested interview schedule was used to collect data. From a sample size of 2525 workers, it was revealed that 66.9 per cent of absenteeism was due to sickness and a blue collar industrial worker lost 21.5 days as compared to 11.9 days of a white collared worker. The health complaints by the workers were those related to musculoskeletal system, gastrointestinal systems, hypertension, respiratory system and other minor ailments. The researchers thus concluded that industrial workers especially those in blue collar and shift jobs lose a higher number of days due to sickness absenteeism and also are impacted with occupational health problems.

In a study conducted by **Parimalam et.al. (2007),** on the workers working in a garment manufacturing unit of Tamil Nadu, an attempt was made to assess the knowledge and awareness among them regarding health problems related to their work. The study also aimed at assessing the attitude and practices that they adopted in order to deal with these problems. A cross sectional study on 216 respondents was conducted who were employed in three different sections of the unit namely, cutting, stitching and finishing. The researchers observed that since

the workers were involved in repetitive tasks all day, they were facing many work related health problems. The data and results of the study indicated that although the workers belonging to all the three sections were aware and had high knowledge regarding health problems, the knowledge about personal protective equipment differed by sections in which they were employed. The study revealed that more than one half of the workers in all sections were aware of the benefits of personal protective equipment, however in the cutting section very few were actually using it. Thus the researchers revealed that there was a wide gap between the knowledge of the workers and the practices that were associated with protective devices.

Physiological problems at work are attributed to the nature of work and exposure to hazards. To understand these problems among the salt workers in Rajasthan a study was conducted by **Sachdev et. al. (2006)**. In their study the researchers aimed to identify the problems faced by salt workers. Data was collected from 865 salt workers and the information indicated that 60.7 per cent of them experienced eye related problems while 43.8 per cent of them experienced skin related problems. Other symptoms like breathlessness, pain in the joint and headache was experienced by 52.1 per cent of the respondents working in the salt industry. The researchers thus concluded that eye problems could be due to exposure to sunlight and glare caused by its reflection on salt crystals. The other symptoms and problems that the workers suffer are also attributed to the nature of work and the work environment.

2.2.2. Studies Related to Psychosocial Problems Faced by Industry Workers

A systematic review was conducted by **Patangia et. al., (2023)** to understand the impact of exposure to harmful chemicals, environmental and psychosocial factors like stress and anxiety on the reproductive health of women working in the manufacturing industry. They selected 14 articles from central databases like SCOPUS, Web of Science and Pubmed to understand the problems related to occupational health, menstrual, menopausal and pregnancy stress. They also studied the impact of pandemic on the health risk that is associated with financial and diet related issues. Other factors like stress, feeling of being discriminated

against, anxiety etc. was found to be the factors contributing towards poor reproductive health.

Lim et. al., (2017) conducted a study based on earlier research that stated that poor mental health of the workers reflects in their work performance. And thus, if the work environment is made positive and safe it will be reflected in the enhanced psychological conditions of the worker. The researchers used a validated questionnaire to understand four psychological conditions namely, stress (occupational stress and coping mechanism), personal temperament, emotional disturbance and the drinking habits of the workers. A sample size of 430 respondents from construction sites of road, bridge, tunnel and apartment were surveyed in Korea. Different tests like Z-test, ANOVA and cross tabulation were used to achieve the objectives of the study. The results showed that a significant number of respondents had high levels of stress and every two out of five workers suffered from depression and anxiety. It is startling to note that three out of five workers had a high addiction for alcohol and thus needed clinical intervention.

Boschman et. al., (2013) conducted a cross-sectional study by selecting 1500 bricklayers and supervisors. The aim of the research was to assess the psychosocial work environment and understand its association with the mental health complaints among the bricklayers and construction workers. The tool used to collect relevant data was a Dutch Questionnaire on the Experience and Evaluation of Work. Scales to assess fatigue during work, need for recovery after work, symptoms of distress, depression and post-traumatic stress were also used. The information thus collected revealed that in comparison to other working populations, the bricklayers and the supervisors experienced significant levels of psychosocial problems. High speed of work along with the volume was the direct reason for them experiencing depression. Symptoms of depression in construction supervisors were also associated with their low involvement in the decision making process and lack of support. Thus, the researchers concluded that the psychosocial work environment was positively related to the symptoms of common mental disorder.

A study was conducted on 4500 Iranian workers with an aim to assess the association between workplace psychosocial factors like job demand, job satisfaction, job appreciation etc. and the early onset of disabling lower back pain. The results indicated that higher job strain and lower job satisfaction may be a significant cause for lower back pain in the future. The results and findings of the study suggested that necessary steps can be taken towards preventing diseases and promoting health amongst the workers at the workplace **(Ghaffari et. al., 2008)**.

2.2.3. Studies Related to Occupational Health Hazards in Industries

Workplace hazards may have a great impact on the wellbeing of the workers. This was analysed in a study conducted by **Benson (2021)** among the workers of the oil and gas industry. The researchers attempted to assess the health hazards present in the operational environment that imposes various risks to the workers. For the study, 327 respondents from different departments of the Nigerian oil and gas industry volunteered to participate. The results indicated that out of all the hazards, ergonomic hazards were the most predominant followed by physical hazards, chemical hazards, psychosocial hazards and biological hazards. These hazards imposed further health threats were either short term like skin irritation, eye irritation, headache etc or long term like respiratory disease, leukaemia, musculoskeletal disorders etc. The researchers recommended that hazard assessment should be conducted in industries along with suitable supervision on the workers and also frequent medical testing to check the health status of the workers.

A cross sectional study was conducted in 25 tannery industries of Bangladesh by **Sultana et. al., (2020).** A total of 200 respondents working in the industry were interviewed through a semi-structured questionnaire and also by using a hazard assessment checklist. The information obtained revealed that the majority of the workers received no training with respect to the work that they were expected to do. The workers also had their own analysis of the hazards present in the workplace like unsafe handling of chemicals, machines and raw materials, safety issues related to the tanning process and also poor housekeeping. They also perceived improper lighting, noise, dust and poor ventilation as workplace hazards. The respondents highlighted that they suffered from skin, respiratory,

eye, gastrointestinal and musculoskeletal problems due to their work. Amongst the other concerns the respondents commented on the lack of some facilities in their industry like first aid treatment, canteen and child care.

Al-Zboon & Forton (2019), conducted a study in a rolling steel plant to assess the indoor air quality and identify measures that could help in improving it, since the air quality had a direct impact on the occupational health of the workers and their comfort and productivity also depended on it. For the study the researchers assessed many air quality indicators namely carbon monoxide (CO), carbon dioxide (CO2), volatile organic compounds (VOCs), nitrogen oxide (NOx), sulphur dioxide (SO2), ground level ozone (O3), particulate matter (PM10 and PM2.5). The information received and the results obtained showed that CO and VOCs were found in high concentrations near the furnace while SO2 and CO2 were highly concentrated in the rolling and quenching process area. Another concern was the high levels of PM10 and PM2.5 which were beyond the acceptable international standards. The researchers also indicated that high temperatures near the furnace along with high levels of VOCs and PM could be responsible for potential negative health effects. Thus, such an environment would not only impact the respiratory system but will also have a detrimental effect on the cardiovascular system as well as cause eye irritation. The researchers also found that the Hazard Indices (HI) is more than 1 which is enough to pose a possible health risk, and thus they concluded by giving some recommendations to improve the situation. They emphasized on setting local standards for indoor air quality, getting medical check-ups done on a regular basis, including job rotation strategy and also providing good indoor ventilation.

Azuike et. al., (2017) conducted a study on the workers in automobile assembly plants to assess the determinants of knowledge of occupational health hazards among them. The researchers stated that in order to protect the occupational health of the workers it is necessary that they should have sufficient knowledge of the hazards at the workplace. Thus they conducted a cross sectional study where data was collected using an interviewer administered semi structured, pre-tested questionnaire to fulfil the objective of determining those factors that determine the knowledge regarding occupational health hazards among the

automobile assembly plant workers. Data was collected from 318 respondents working in the production department of two companies who have worked for a minimum of 6 months. The respondents were majorly males (96.9 per cent) and very few females (3.1 per cent). After analysing the data using SPSS and applying Chi-square tests, it was revealed that neither age nor marital status had statistically significant association with knowledge regarding occupational health hazards. Also, there was no statistically significant association between age and knowledge regarding safety measures as well as marital status and knowledge regarding safety measures.

Khan et. al. (2015), conducted a cross sectional study to find out the occupational health hazards faced by garment industry workers of Dhaka in Bangladesh. They conducted face to face interviews for 145 respondents who were selected through a purposive sampling technique. The data that was collected on a structured questionnaire revealed that many of the respondents complained of noise pollution. The respondents complained of headache, shoulder pain and insomnia. The study revealed that the prevalence of occupational health hazards was 88.28 per cent. The overall conclusion drawn by the researcher was that there was a significant relationship between noise and headache experienced. Also the length of the job had an association with the backache. The study stated that a better working environment and health will aid in increasing the efficiency and productivity of the workers.

Oza (2015) in her study observed that 80 per cent of the workers working in various industries of Gujarat were aware of the occupational hazard but chose to ignore it in order to save their jobs. She also stated that even if protective devices are provided to the workers they neglect it most of the time as there are no strict checks on them. An interesting finding made by her was that 93.54 per cent of the workers realized that their occupational safety is not the sole responsibility of their employer. They themselves are equally responsible for it. Oza also mentioned that apart from training and precautions taken at the workplace, an active safety committee in every industry would be beneficial in providing a safer environment.

A cross sectional survey was conducted on 94 sawmill workers in Nigeria working as machine operators, plank carriers and plank vendors. A structured questionnaire was used to assess the awareness of the respondents regarding occupational health hazards

and safety practices. The results indicated that the respondents were exposed to a number of hazards namely 'sawmill dust' (95.7 per cent), 'noise' (81.1 per cent) and 'injury from machines' (75.5. per cent). The respondents complained of breathing issues, hearing loss and constant pain in the back. The researchers also reported that although personal protective equipment like face masks, protective goggles and hand gloves were provided to the workers, only 34 per cent of them actually used the safety devices regularly. The study thus concluded that even though the Nigerian sawmill workers were aware of the concept of occupational hazards, they did not incorporate its principles and guidelines in the day to day working **(Faremi et. al., 2014)**.

A study was conducted on the women in the manual brick manufacturing industry to understand the physiological as well as psychosocial factors associated with their occupation. The researchers randomly selected 55 brick moulders having a minimum of 2 years' experience. Different tools were used to attain the objective. The occurrence of physiological factors was assessed by doing the biomechanical analysis using the OWAS, RULA and REBA methods. Modified Nordic Questionnaire was used to analyze the pain in different parts of the body and the intensity of the pain was studied using the Body Part Discomfort Scale. The Lung Function Test was done using the Lung Function Machine and software. And lastly, the occurrence of health problems due to psychosocial factors was also analysed. The researchers concluded that the respondents were constantly adapting to awkward postures and were lifting heavy loads that resulted in constant aches in the upper parts of the body. In conclusion, there were some recommendations given by the researchers that emphasized on creating awareness about the need for personal protective equipment in the workers as well as the management. Rotation of duty and physical exercises will help in reducing boredom, stress and anxiety. Better workplace layouts and making the workers aware of the proper work methods will also contribute towards making the workplace safer **(Bijetri & Sen, 2014).**

Kifle et al. (2014), conducted a study on the workers of the iron and steel industry in Addis Ababa, Ethiopia. The objective of the study was to assess the prevalence of work related injuries and other risk factors related to this particular industry. The researchers used a cross sectional study design in which four iron and steel industries were stratified into three sections. A sample size of 453 workers was further selected by simple random sampling. A face to face interview schedule was carried out using a structured and pre-

tested questionnaire. The collected information was statistically analysed to identify the risk factors that lead to injuries. Analysis revealed that there was a 33.3 per cent prevalence rate of injuries every year. The common causes of injuries were splitting and flying objects, hit by falling objects and machinery. Workers were also exposed to excessive noise, fumes and dust along with dangers of unguarded machinery, splitting materials and sparkling metals. Interestingly, the study further stated that those workers who consumed alcohol during the day, did not have a spouse, thought of their work as being highly stressful and not caring to use personal protective equipment are more likely to be injured as compared to others. Thus the researchers concluded that work related injuries were very common in the iron and steel industry. They recommended that training should be given to these workers in which awareness regarding risk factors can be created along with providing them with PPE and also the industry must establish safety programs to reduce workplace injuries.

Animashaun & Odeku (2014), conducted a study on the importance of a work environment that is not only attractive enough to keep the employees motivated but also one that ensures safety and health of the workforce. The study was based in Nigeria and it focused on the relationship between health and safety and the physical layout of the work environment. It highlights that the layout should be such that there is scope for easy evacuation of the employees as well as the chances of injuring each other due to workplace accidents can be greatly prevented. The study also stated that the work conditions in Nigeria were very poor due to high rates of unemployment, outdated legislation, corruption etc. and thus little or no attention was given to the physical workspaces. Unsuitable furniture, poor ventilation and lighting, excessive noise, no awareness and use of PPE etc were a feature of the workplace environment that severely impacted the health as well as the performance of the employee. Thus the researchers concluded that the physical work environment is of great importance and laws need to be strengthened with the objective of removing occupational hazards by using safer chemicals, mentoring and training, using personal protective equipment, installing better workplace policies etc.

Yu et. al. (2013), conducted a survey on the occupational health hazards among female workers in the electronic industry located in China. The researchers systematically sampled the 8300 respondents from 4 provinces of China. Questionnaire method was

used to collect the data on occupational hazards faced by the respondents and the occurrence of occupation related diseases. The results showed that 51.9 per cent of the total respondents were exposed to at least one or more hazards at the workplace. The data also revealed that among the chemical hazards, the most common was organic solvent followed by hazards from heavy metals. In case of ergonomic hazards, poor postures, repetitive movement and improper method of lifting heavy weight were areas of concern that were impacting the health of the female workers adversely. The results from this study indicated that female workers in the electronic industry of China were facing serious occupation related health concerns.

Said et. al. (2012), conducted a study in Malaysia to analyse the determinants that are responsible for causing workplace injury. The researchers conducted this study across 44 manufacturing industries in Malaysia between 1993 and 2008. The data set was both cross sectional as well as time series. For the study three types of injuries were included, that is, fatal accidents, permanent disability and temporary disability. By adopting the structural and business cycle, the panel data was then tested using fixed effects estimation method. The results revealed that the size of the organization, type of work, gender and cyclic variation are important factors that impact workplace injuries in Malaysian industries. According to the results various conclusions were drawn. Firstly, accidents are better controlled at large firms as compared to small firms. It may be due to greater awareness of organisation safety and health among workers of large organizations. Due to the lack of law enforcement in smaller firms, the awareness regarding OSH is lacking. Secondly, workers in the production stage of the business cycle were exposed to greater workplace injuries. Preventive measures for this would include appropriate training programs and development of skills through technical education. Emphasis was made on the role of the employers by hiring safety machines and equipment along with safety devices to further reduce the risks of getting injured at the workplace. The study also revealed that female workers show significant rates for workplace injury. Finally, attitude, inadequate knowledge, lack of experience and poor supervision also lead to accidental risks. The researchers suggested that OSHA must be enforced in the manufacturing industries of Malaysia.

Research was undertaken to study the impact of different noise frequencies in an industrial set-up. Six big industries were identified in Mysore (Karnataka, India) to determine the noise levels and the impact that it has on the physical, physiological as

well as psychological system of the workers. It was determined that the workers who were exposed to low and mid octave sound frequency had developed several impacts like ‘eyeball pressure’, ‘ear pulsation’, 'pain in neck’, ‘awakening from sleep’, ‘backache’ etc. The noise also had its psychological impact which was evident in the irritability amongst the workers **(Prashanth & Sridhar, 2008)**.

Dawal & Taha (2006), conducted a survey in automotive manufacturing companies in Malaysia to investigate the relationship between job satisfaction and environmental factors. Data was collected through questionnaires and observation. The analysis indicated that there was a significant association between job satisfaction and environmental factors.

2.2.4. Studies Related to Coping Strategies adopted by Industry Workers

Bonsu et. al. (2020), conducted a study on occupational hazards faced by the bakers in Kumasi Metropolis of Ghana. A cross sectional study design was adopted where 172 bakers including employees and employers were purposively selected. Data was collected through questionnaire administration that consisted of close ended questions. The results obtained from this data indicated that the respondents were exposed to many occupational health hazards like physical hazards including fire, noise, smoke/dust, high temperature), chemical hazards, ergonomic hazards, psycho-social as well as biological hazards. The researchers stated that consistent exposure to such hazards will be having a negative impact on the quality of life of the respondents. The study however revealed that the bakers had adopted certain coping strategies to deal with such hazards. One major finding for the study was that there was a different coping strategy adopted for each of the different types of occupational hazard. In order to deal with physical hazards, the bakers used physical barriers, manual regulation, rest breaks and also stayed hydrated as coping mechanisms. To deal with biological hazards like mosquitoes, insects and rodents, the coping strategy adopted was to wear long sleeved clothes and use mosquito repellent or coil. Another unique method was to burn orange peels and drink energy tea as a remedy to prevent malaria. The exposure to psycho-social hazards like stress, poor interpersonal relationships and verbal abuse lead to low productivity, absenteeism, poor concentration and thus it was dealt with by showing respect at the workplace, resolving disputes and

reducing work hours. Since the respondents were exposed to ergonomic hazards due to work postures that required them to stand, sit, bend and do repetitive work. Also sometimes lifting heavy equipment led to musculoskeletal disorders. The coping strategy adopted to deal with this problem was to take mini breaks and ensure proper lifting techniques and appropriate postures while doing their work. The researchers thus concluded that if participatory and action oriented programmes are organised weekly and guidance is provided to the employees on correct work postures and safe handling of hazardous substances then it will go a long way in improving the health and safety of the bakers. The researchers also emphasised the role of employees in ensuring a safer workplace by themselves obeying safety rules and regulations, getting trained from time to time and using appropriate personal protective equipment.

Gholamzadeh (2011) conducted a study on the occupational stress and coping strategy among nurses working in the Admission and Emergency Department of Hospitals related to Shiraz University of Medical Sciences. The researchers conducted a descriptive survey on 90 emergency ward nurses. The information was collected through a self-administered questionnaire and this data helped in analysing the sources of job stress and coping strategies adopted by nurses. The data revealed that maximum respondents were women between the age group of 23 to 50 years and they had less than 5 years of work experience. Several occupational health hazards were recognized that included problems related to workload, exposure to safety hazards, lack of support and lack of equipment. The researchers in their study concluded that the coping strategies used by the respondents were more of those focussing on emotions and there was lesser use of problem focussed approach. Thus the common strategies adopted by the nurses were self-controlling and positive reappraisal and the least used strategy was that of accepting responsibility.

2.2.5 Studies on Diamond Industry

A study was conducted by **Yadav et.al. (2019)** to assess the levels of stress among the diamond cutting and polishing workers of Ahmedabad. The objective of the study was to assess the stress levels experienced by workers with respect to their job tasks at the diamond cutting and polishing unit. Three hundred and forty-two workers belonging to five different job tasks were selected for the research. 37 were ‘ghat tarasi’ workers, 35

from the ‘table cutting’ section, 123 from ‘talia bottom’, 78 from ‘athpel’ while 69 belonged to the ‘mathala’ section. DASS- a self-report instrument that is designed to measure three related negative emotional states of depression, anxiety and stress was used. DASS consists of 42 items which includes 14 items each for assessing the states of depression, anxiety and stress. After the data was collected it was statistically analyzed. One-way analysis of variance (ANOVA) was applied to analyze the impact of job type on the psychological problems experienced by the workers. The results showed that irrespective of the job tasks, the workers suffered from mild levels of stress. From the 342 diamond workers, 197 were found to have normal levels of stress while 47,43 and 40 were found to have mild, moderate and severe levels of stress. 15 workers however had very severe levels of stress. The researchers in their study also aimed at assessing the relationship between the stress levels and the type of job. The results indicated that the group involved with ‘mathala’ work was the most stressed. This was followed by ‘talia’ workers, ‘athpel’ workers, ‘table cutting’ workers and the least stressed group was the ‘ghat tarasi’ workers. The study thus concluded that the diamond workers suffer from mild levels of stress and experience psychological issues related to emotional, cognitive and behavioral aspects. They could be experiencing frustration, moodiness, difficulty in relaxing, low self-esteem, worthlessness and a feeling of losing control. They also experience low energy, headaches, nervousness, dry mouth, forgetfulness, poor judgement, changes in appetite, addiction of alcohol, drugs etc. Based on the results the researchers thus concluded that the workers of the diamond industry experienced mild levels of stress irrespective of the job that they are doing.

In a study conducted by **Bharadva et. al. (2014)** the socio-demographic profile of the diamond cutting and polishing workers of Surat city was evaluated. Another important objective of the study was to identify the prevalence of tobacco use in its various forms and factors related to it. The researchers conducted a cross sectional study of 295 workers selected randomly from different diamond cutting and polishing units. The respondents were then interviewed using a pre designed and pre tested semi structured questionnaire. The data collected was then statistically analysed. The results revealed that the mean age of the respondents was 29.51 years. The study revealed that 71.2 per cent of them had a history of addiction to some form of tobacco. Mean age of starting tobacco intake was found to be 21.44. Mawa masala, khainee and gutkha in the same order of preferences were found to be commonly consumed by the diamond industry

workers. 11.4 per cent of those consuming tobacco were consuming the smoking form of tobacco that included cigarettes and bidis. Upon investigating the reasons for tobacco initiation, the researchers found that the primary reason for doing so was peer pressure followed by psychological stress. The researchers concluded that tobacco can lead to increased problems related to health and poverty. Respondents are susceptible to higher risks of falling ill, developing cardiac and respiratory diseases and even dying prematurely. Researchers thus stated that the prevalence of tobacco is highest among diamond workers as compared to the general population. They suggested that intervention strategies should be incorporated in order to reduce the consumption of tobacco amongst this specific population.

Engelshoven (1999) in her report on the diamond workers of the Surat diamond industry attempted to understand the reason for the absences of strikes or mass protests in the industry in spite of the poor working conditions and torture that the employees were subjected to for a long time. The researcher had conducted the study in the first place to study the role of caste in Surat between March 1996 to March 1997. While studying about the Saurashtra Patels the researcher realized that a report on this community would be incomplete without studying the significance of diamonds in their lives. The article was then divided into two parts, the first part gave an insight into the general functioning of the diamond industry of Surat and the second part emphasized on an important aspect of the surat diamond industry which is the absence of strikes and mass protests. The report presented by Engelshoven revealed that the conditions of the diamond workers were very poor as they worked in hot, stuffy and gloomy rooms with no ventilation and poor or no toilet facilities. Long working hours and meagre salaries added to their sufferings and also they had to bear the torture of their employers. But despite this situation the researcher found that there were no strikes or protests of any type. This was attributed to the community that the workshop owners as well as the workers belonged to. This community is of the Saurashtra Patels that have a unified identity. The Saurashtra Patels who originate from the Saurashtra region of Gujarat are basically farmers with a very humble background. The rise of this community on both the economic as well as social ladder is because of the diamond industry. And it is this unity in the community and their rise from poor backgrounds that make them respect the industry.

A study was undertaken by **Kutty (1991)** to study the various aspects of the diamond cutting and polishing industry of Kerala. The objectives of the study were to analyse the financial performance and profitability, employment potential, problems and prospects of the industry and also to analyse the problems of the diamond workers. 47 diamond cutting and polishing units located in Thrissur district of Kerala were selected through the stratified sampling technique. Primary and secondary data were collected based on which conclusions were drawn. Interviews of various agencies and individuals were also conducted. The selected units were further divided into five categories on the basis of investment. A detailed study conducted by the researcher revealed that the industry is a highly labour intensive study but the average investment per worker is not very high. Since there are no credit sales involved, there are no debtors in the industry thus making the working capital requirement very low. The study also emphasized that there are only two elements of cost i.e. conversion cost and cost of administration. The industry also has a low breakeven point due to lower fixed expenses. Analyzing the background of the workers it was revealed that 88 per cent of them were below the age group of 35 years. This could be due to the fact that the work involves squating on the floor and adopting postures that cause severe back aches and also the need to have very sharp eyesight. The industry also did not have fixed working hours and since wages were provided on a piece rate basis, workers tended to overwork in order to earn more. However, the study also revealed the problems faced by the workers in terms of job insecurity due to the threat of closure of units in case of lesser work due to its dependency on Gujarat and Maharashtra industry for the supply of rough diamonds. Other problems include absenteeism, no facility to provide training and also no benefits to the employees in terms of provident fund, gratuity, ESI etc. since it is mostly an unorganised sector. The workers are also not provided holiday wages and acts like Factories Act that are necessary to safeguard the interest of the workers are not applicable to these units. The study concluded that the diamond cutting and polishing industry has great employment potential as against low investment and thus initiatives by the Government should be taken to expand this sector in other districts of Kerala.

2.3. Conclusion of Review of Literature

The review of literature revealed that a lot of effort has been taken to understand the physiological problems, psychosocial problems and occupational health hazards faced by workers in various industries like construction industry, textile industry, iron and steel industry etc within India and also outside.

An analysis of the studies done on the diamond polishing industry revealed that most of the studies are conducted in India and they are focussed on the financial aspects of the industry, the stress levels experienced by the workers and their addiction to tobacco. Not many studies have been done outside India regarding the problems faced by the workers, this could be due to the fact that most of them are organised sectors and may be better equipped with the knowledge regarding occupational health and safety. The data for review of literature was compiled from a variety of sources, including books, journals, earlier studies, and various websites. The researcher became interested in this area of study after reviewing the existing literature and finding that there is not enough work done on the problems and hazards faced by the diamond polishers of the small polishing units of Surat. The researcher also aimed at suggesting coping strategies and developing comfort enhancing products for the polishers. As a result, the present study was undertaken.