

A STUDY ON THE DISEASE PROFILE ASSOCIATED WITH THE WORKERS OF PRESS INDUSTRIES IN DHAKA CITY

*A Project Report to be submitted in the Department of Pharmacy for the Partial
Fulfillment of the Degree of Bachelor of Pharmacy.*

Submitted By

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DECLARATION BY THE RESEARCH CANDIDATE

I, Mohsin Ibna Amin, ID: 2012-1-70-002, hereby declare that the dissertation entitled “**A Study on the Disease Profile Associated with the Workers of Press Industries in Dhaka City**” submitted to the Department of Pharmacy, East West University, in the partial fulfillment of the requirement for the degree of Bachelor of Pharmacy (Honors) is a genuine & authentic research work carried out by me. The contents of this dissertation, in full or in parts, have not been submitted to any other institute or University for the award of any degree or Diploma of Fellowship.

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DEDICATION

This research paper is dedicated to my beloved parents for their unconditional support.

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List of Abbreviations

BP	Blood Pressure
CMYK	Cyan, Magenta, Yellow & Black
CTP	Computer-to-Plate
DCM	Dichloromethane
DCP	Dichloropropane
IARC	International Agency for Research on Cancer
IPA	Isopropyl Alcohol
MEK	Methyl Ethyl Ketone
PS	Pre-Sensitized
PVA	Polyvinyl Alcohol
SIR	Standardized Incidence Ratio
TB	Tuberculosis
UTI	Urinary Tract Infection
UV	Ultra Violet
VOC	Volatile Organic Compound

Abstract

Being a third world country, Bangladesh is still developing in many core areas. One of this area is the level of literacy. The people who are working in the printing presses of Dhaka are either illiterate or simply passed the high school. However, despite their literacy level, they are required to work with various hazardous elements without knowing the consequence of unprotected handling. Unless and until the proprietor of these industries take necessary steps against it, these workers shall continue working with these hazardous chemicals. Due to this, it is of immense necessity that the workers are made aware of the dangers associated with these chemicals and the proprietors know about the health hazards by those chemicals. The prime purpose of this study was to know about these diseases caused as a consequence of the aforementioned chemicals used in the printing industry and to have a knowledge about the level of awareness among the employers to ensure safe place and environment of work. The research was conducted among 250 workers from different printing houses of Dhaka city. From the result of this research, it was determined that the workers of the printing industry were suffering from various diseases. With gastritis (21.73%) and different kinds of skin diseases (15.65%) being the disease mostly suffered, the workers were also suffering from diseases such as high blood pressure (16.52%), eye irritations (32.80%), coughing (30.40%), joint pain (28%), muscle weakness (18.80%), etc. In addition to these, the workers also suffered from various occupational injuries due to the lack of proper safety training and protective clothing. Moreover, with the lack of proper medical facilities as well, the workers had been suffering from the above diseases for years after years without even realizing it. Lastly, it is pertinent to acknowledge that the result of this study should not be taken as conclusive. To obtain the whole picture of the aforementioned crisis the press industries of Bangladesh, further studies are required.

Key Words: *Press, Printing Industries, Chemicals, Allergic Dermatitis, Gastritis, Dhaka City, Injury.*



CHAPTER ONE

INTRODUCTION

1.1 Introduction

Printing is one of the largest manufacturing industries in Bangladesh in terms of the number of establishments. It employs huge number of population establishments that range from sizeable publishers of newspapers, magazines and books to smaller companies printing brochures, cards, calendars, various advertisements. Printing on textile, plastic and metal surfaces are also common.

Printing is a chemical-intensive industry with its workers being generally exposed to many hazardous chemicals, in particular the printing solvents. So different health issues regarding this chemical uses are quite common to the press workers. Other than the health hazards, organic printing solvents that contain flammable substances may pose a fire and explosion risk.

1.2 History of Press in Bangladesh

It cannot be said with certainty where the first printing press was set up in Bangladesh. It is conjectured that the first printing press in Bangladesh was in Rangpur during 1847, about 335 kilometres away from Dhaka. The first printed piece from this printing press was a weekly newspaper named Rangapur Barttabaha in August 1847. In addition, the first two Bengali weekly newspapers were from Rangpur. Printing machines took more than sixty years to reach East Bengal or Dhaka from Kolkata. The first English weekly newspaper, The Dacca News, was printed and published from Dhaka in 1856. So, it is assumed that after nine years of Rangpur press, the first printing machine of Dhaka was established and the press was named 'Dacca Press' (Mamoon, 2005).

1.3 Different Types of Printing Processes

All printing processes produce graphic images on a substrate, which can be paper, textile, plastic, metal, etc. The following printing techniques are commonly practiced locally:

- Lithographic printing
- Flexographic printing
- Gravure printing
- Screen printing

The very traditional letterpress technique is now a relic of the past, which is fast being phased out. Technological advancement, especially in information technology, has given rise to other printing processes such as digital printing, inkjet printing, etc. that operate on principles quite unlike the traditional ones.

A printing process is generally divided into four steps: pre-press, make-ready, press and post-press. The pre-press operation is the process that transfers the artwork or design (often in the form of negative or positive films) into an image carrier, most often a plate, but can be a cylinder or screen. This operation involves such physical or chemical processes as exposure to ultraviolet (UV) light or laser, photoengraving, developing and further processing. Make-ready prepares the press: the plate is assembled to the machine and mechanical adjustments made. Press step is the actual printing operation. Lastly, post-press is the finishing work such as binding, gluing, etc. of printed materials to the final printed product.

The newly developed automatic computer-to-plate (CTP) technology is a digital plate-making technique that can do away with those tedious conventional pre-press operations and so eliminate the use of many hazardous chemicals. Essentially, the plate making machine is another type of printer with the images to be printed being composed on a computer and the final output transported directly onto the press-ready plate instead of a piece of paper or film. There are different techniques of digital plate making available for the various printing processes (Bruno, 1982).

1.3.1 Lithographic Printing

Lithography is by far the most widely practiced paper printing technique in the local market. It is a planographic process in which the printing and non-printing areas of the plate are both at the same level. It is invariably an offset process in that the image is transferred to an intermediate blanket cylinder from which it is transferred to the paper as distinct from those direct processes, such as flexography and gravure printing, where the image is directly transferred from the image carrier to the substrate.

Lithographic printing is based on the chemical repellence of oil and water. The image area is oleophilic (oil-receptive) so it attracts the ink whilst repelling water, whereas the obverse applies to the hydrophilic (water-receptive) non-image area.

Different types of printing plates are used in lithography: photomechanical, electrostatic, bimetallic, etc. They are generally made from metals like aluminum, although other base materials such as paper and polyester are also used. The most common printing plate is of the photomechanical type, which is made from thin aluminum sheets coated with light-sensitive material (also known as photo resist) such as diazos or photopolymer resins, together with asphalt, shellac, gum Arabic or polyvinyl alcohol. In practice, most surface plates in use are pre-sensitized (PS), that is, those that are supplied already coated with light-sensitive material. Photopolymer is by far the most widely used light-sensitive material. The following discussion will revolve around such plates.

The plate can work with either negatives (subtractive) or positives (additive). In either case, a transparency carrying the image of the artwork is placed over the sensitized plate in the exposure frame. Vacuum is applied to ensure good contact so as to get a sharp resulting image. The plate is then exposed to UV light.

For negative-working plates (the plates work with negative films), negative films are used and vice versa for positive-working plate, but the type of photopolymer used is different. In the former, upon exposure to UV light, the photopolymer hardens, whereas for the latter, it becomes unstable. In both cases, the end effect is that the photopolymer coating, which is ink receptive, remains on the image areas whereas those on the non-image areas are removed.

For colorful printing, the color of the original is separated into the four ink colors, namely, cyan (blue), magenta (red), yellow and black, (often denoted by the four letters CMYK), and a separate printing plate is produced for each color. The four ink colors are generally adequate for most color printing jobs. In some cases, up to eight ink colors may be required to match the original. The sketch below illustrates a typical set of rollers for printing a particular color. Printing more colors requires more set of rollers (Bruno, 1982).

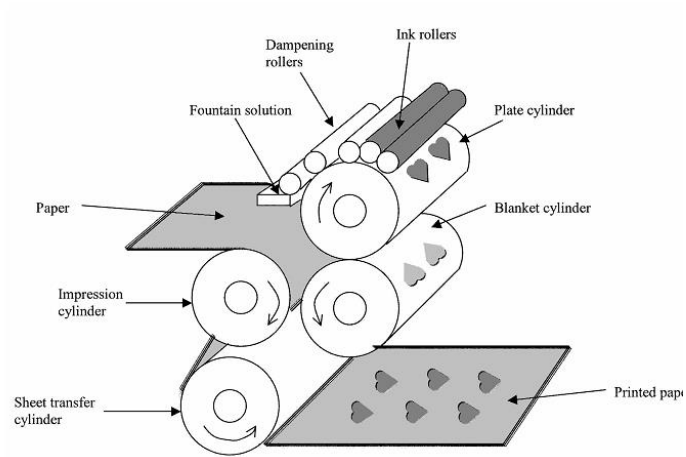


Figure 1.1: Lithographic Printing (Occupational Safety and Health Branch, 2004)

1.3.2 Flexographic Printing

Flexographic printing is mainly used to print packaging materials. The flexographic plate, which is made of rubber, plastic or other flexible material, has the image area raised relative to the non-image area. The printing ink is applied to the raised area, which transfers the image to the substrate.

Similar to lithographic plates, light sensitive photopolymers are used to make flexographic plates. To make the printing plate, a negative of the image is placed on the plate material and exposed to UV light that hardens the image areas on the plate. After exposure, the unexposed coating material (non-image areas) on the plate is washed out, usually with water. The plate is allowed to dry and then exposed to UV light to complete the curing process.

Flexographic printing uses low-viscosity, fast-drying inks that are based on alcohols, water, hydrocarbon solvents or UV monomers. The ink is first applied to the anilox roller (a steel cylinder engraved with a pattern of pits or cells). The cells (the depressions) are then filled

and doctored before delivering the ink to the image area of the plate cylinder for printing onto the surface of substrate (Bruno, 1982).

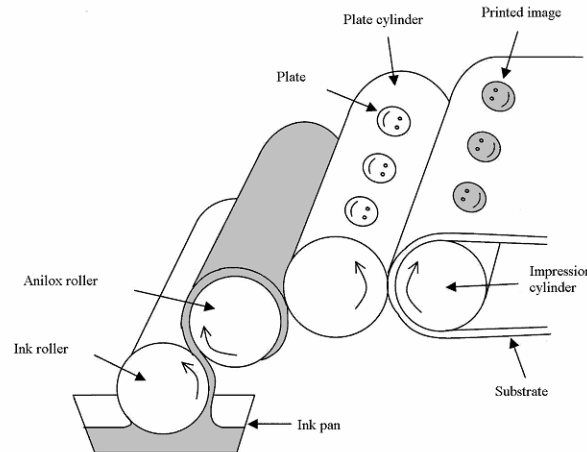


Fig 1.2: Flexographic Printing (Occupational Safety and Health Branch, 2004)

1.3.3 Gravure Printing

Gravure printing is the reverse of flexography in that the image is recessed below the printing plate surface. In most cases, the image is directly formed on the plate cylinder. During printing, the ink is contained in the recessed image cells that are arranged in a regular grid, typically 60 lines/cm on the cylinder. The cylinder rotates through a trough of ink and is scraped by a metal doctor blade to remove surplus ink from the non-image surface of the cylinder while the cup-like shape of each cell holds the ink in place.

The various shades of tonal gradations are governed by the size and depth of these cells that in turn control the volume of ink delivered. Thus larger and/or deeper cells contain more ink and give darker shades.

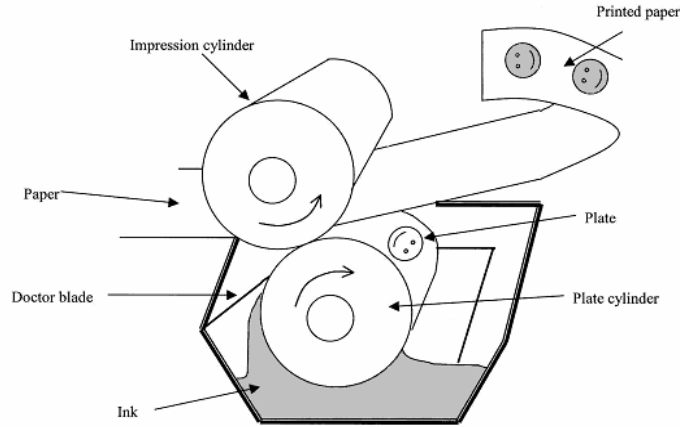


Fig 1.3: Gravure Printing (Occupational Safety and Health Branch, 2004)

In the cylinder preparation, the printing cells are formed by exposing positives to carbon tissue which is a fibrous paper coated with smooth gelatin resist. The resist is sensitized to light by submerging it to potassium bichromate solution.

The carbon tissue is wrapped around the cylinder, and after exposure to UV light the exposed areas are hardened with alcohol and forced air-drying in amber light. In the areas exposed through the positives, membranes of variable thickness are formed, depending upon the amount of light passed through the image positive. The membranes are thick in the highlights and thin in the solids. The tissue is then etched using ferric chloride solution. The thickness of the membranes controls the etching speed, resulting in the formation of cells.

Photopolymers are used to make gravure plates, as in lithography and flexography, so doing away the use of the etching chemicals. In this polymer photogravure process, after the consecutive exposures to UV light in a way similar to the above discussion, the photopolymer-coated plate is developed simply using water, which dissolves away the unexposed parts (image). The final result is a gravure plate where the image is replicated by recessed cells on the surface of the plate (Occupational Safety and Health Branch, 2004).

1.3.4 Screen Printing

Screen printing is a versatile process that can be applied not only to ordinary substrates like plastics, fabrics, metals, paper, but also exotic ones like leather, glass, ceramics, wood or electronic circuit boards. In this printing process, a fine-mesh screen made of silk, nylon or stainless steel is tightly mounted onto a rigid frame. With the non-image area of the screen being blocked, printing ink is forced through the mesh and transferred to the substrate surface by scraping with a rubber squeegee.

It is common to prepare the screen stencil using a photomechanical process, in which a photographic emulsion of bichromated gelatin or bichromated polyvinyl alcohol (PVA) is directly coated, spread and levelled on a screen fabric. The screen is then exposed to a positive of the image using UV light, which “hardens” the emulsion. The unreacted portion (image area), which is water soluble, is rinsed off (Occupational Safety and Health Branch, 2004).

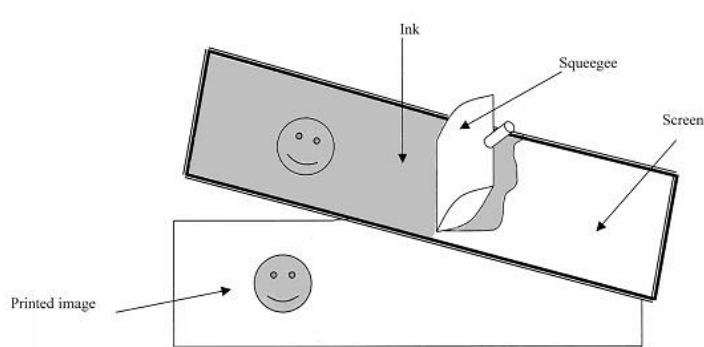


Fig 1.4: Screen Printing (Occupational Safety and Health Branch, 2004)

1.3.5 Letterpress

Letterpress is a traditional relief process, with the image area being raised relative to the non-image area on the printing plate. The original letterpress plate was made by manual mounting of movable pieces of cast metal type in a frame. To improve the efficiency, better plate making techniques have evolved, resulting in the stereotype and electrotypes plates.

The plate can also be made by photoengraving technique. A film negative is placed on the plate coated with a photo resist and then exposed to light. After developing, the coating on the unexposed non-image areas is dissolved away whereas that on the light-exposed image areas remains to serve as a protective mask. The plate is then immersed in ferric chloride solution to etch away the non-image areas to the appropriate depth. After removing the masking material and washing thoroughly to eliminate all chemical residues, the plate is ready for printing use (Occupational Safety and Health Branch, 2004).

1.3.6 Dyeline Printing

Dyeline printing is used to produce a pre-press photographic proof, which is a blueprint or test copy of the printed material for checking the completeness, position and content of the individual graphic elements (texts, images, etc.).

It is done by exposing an original of the artwork onto paper pre-impregnated with diazos and a coupler. It is the coupling of these two that produce azo dyes giving the colours, but in the blueprint paper, there is also a stabilizing acid barrier that prevents their premature coupling. Upon action by UV light, the light-sensitive diazos are decomposed. The paper is developed by exposing it to a strong base, usually ammonia which neutralizes the acid, thus allowing coupling to occur and causing the release of azo dyes in the unexposed areas lying under the image to be reproduced. After developing, the image is shown in various shades of blue colors on the white paper (Occupational Safety and Health Branch, 2004).

1.3.7 Digital Printing

In digital printing, the image is created directly from digital data and transmitted by light to a photosensitive material to create an electronic image, using no films, plates, nor photochemicals. It relies on the ability of selenium to enhance its electrical conductivity on exposure to light, the same principle which photocopying works on.

Instead of light, the image can be created by ion deposition or other electronic processes. In the case of laser printers, the original documents are read and re-created using a laser beam (Occupational Safety and Health Branch, 2004).

1.3.8 Inkjet Printing

Inkjet printing is the process of creating an image on the substrate by controlling the projection of a stream of microscopic ink droplets from a minute nozzle at a small distance above the substrate surface. The process is mainly computer controlled. The design information is sent to the printer through a software program that controls the placement of each droplet of ink onto the substrate (Occupational Safety and Health Branch, 2004).

1.3.9 Other Printing Techniques

There are some special printing methods though less commonly encountered. Hot blocking (also called foil stamping) is mainly used by small-sized printers located in domestic districts for embellishing invitation cards, book jackets, name cards, etc. It uses heat and a heat-activated foil to impart image onto the surface. The ability to produce holographic designs by this process has developed a market place in security printing on substrates such as credit cards.

Pad printing (heat-transfer printing), literally an offset gravure process, which due to the soft nature of the printing surface (pad), can print onto three-dimensional objects like bottles or cans.

Thermography is a press technique that uses heat to fuse a toner to the paper surface, which is then baked to give a professional raised letter effect. It is often used to print business cards, letterheads and invitations.

These miscellaneous printing processes will not be elaborated in detail but the underlying principles and practice of chemical safety discussed in subsequent paragraphs may also be applicable to them (Bruno, 1982).

1.4 The Chemical Hazards

1.4.1 Sources of Chemical Hazards

The most important chemical hazards associated with the printing industry come from:

- a) Pre-press chemicals;
- b) Printing inks;
- c) Fountain solutions;
- d) Cleansing solvents; and
- e) Adhesives and glues.

Many of these substances are proprietary prepared formulations and their chemical components are not always shown conspicuously on their original containers. For example, a product labeled as scratch remover is used to remove oil patches on the unwanted areas on lithographic plates to ensure hydrophilic property during printing. From its container, the content appears innocuous, but in fact it contains potassium hydroxide. Thus, it is advisable to be acquainted with the specific functions of the product since these will often throw some light on their chemical natures. In all cases, users should enquire from the supplier detailed hazard information and user safety precautions of their products (IARC, 1983).

1.4.2 Pre-press Chemicals

As seen in the discussion on printing processes, a wide assortment of pre-press chemicals are used during the pre-press stage especially during plate making: photographic reproduction, photoengraving, etching, fixing, developing, etc.

Many of these chemicals are specially formulated blends which have already been mixed in the right proportions and require no further processing. They are supplied in containers, which can be fitted directly to the processing machine that reduces chance of chemical contact by workers. It is important to follow the working procedures stipulated by the supplier and observe prudent waste disposal practices.

By far, the most common method of plate preparation is to use light-sensitive coatings. There are three main light-sensitive coating materials: photopolymers, diazos and bichromated colloids, which are cured by UV light.

UV light has to be handled with care since ozone may be produced by its action on oxygen in the atmosphere of the enclosure housing the UV light source. UV light can also damage the skin and eyes whether it is viewed directly or from reflected surfaces (IARC, 1983).

1.4.3 Printing Inks

Printing inks are complicated mixtures of chemical compounds, with composition varying by their solvent bases (oil or water), drying mechanisms (absorption, evaporation oxidative polymerization, etc) and adopted printing processes. Of particular concern is the UV light-curable inks since they pose UV light hazards and may contain polyfunctional acrylates and methacrylates that can cause skin irritation and sensitization.

The main component of a printing ink is the pigment. For examples, black inks usually contain carbon black, whereas white inks contain titanium dioxide, calcium carbonate, zinc oxide, clay, etc. Colored pigments can be organic or inorganic. Organic pigments are mostly synthetic colorants of aromatic hydrocarbon origins such as benzene, naphthalene or anthracene, containing chromophoric groups $=C=NH$, $-CH=N-$ and $-N=N-$. Inorganic colored pigments usually contain metals such as lead, chromium, copper, mercury, iron, etc.

The fluid component that acts as a carrier for the pigment is known as the vehicle, consisting of varnishes plus performance additives like driers, waxes, fillers, modifiers, etc. and solvent/diluent. A varnish is a homogeneous solution of resin in oil or a volatile solvent. The solvent or diluent may be aliphatic esters, aromatic hydrocarbons, alcohols or ketones (Leach and Pierce, 1993).

1.4.4 Fountain Solution

To impart an oleophobic surface to the non-image areas, lithographic printing plates are dampened with fountain solution. Its main ingredients are isopropyl alcohol (IPA) and phosphoric acid. IPA reduces water surface tension and also helps avoid emulsification of the ink into the fountain solution (Williams, 1992).

1.4.5 Cleaning Solvents

Emissions of volatile organic compound (VOC) from most cleaning solvents are of a great concern to the health and safety in workplace as well as the environment. Major sources of VOC emissions are exhausts primarily from printing presses and vaporization of cleaning solvents during cleanup process.

The printing parts have to be frequently cleansed to prevent accumulation of dried ink and paper dusts. Common cleaning solvents used include kerosene, glycol ether, alcohols, toluene, hexane and specially formulated proprietary solvent blends. These solvents may present health and fire risks if protective measures are not adequate.

The blankets installed on rollers are cleaned following a run or after a color change. This is usually done manually by workers using solvent-wetted rags. For convenience, pots of organic cleaning solvents, usually uncapped, are kept alongside with printing machine, causing evaporation of VOC to the workplace. As the container is mostly not the original one and if not be properly labeled, workers may be unaware of its potential safety and health hazards (Kübler, 1993).

1.4.6 Adhesives and Glues

Adhesives and glues are mainly used in holding units of printed material together in the post press finishing operations. Depending on their compositions, these substances may cause irritation or sensitization of the skin or respiratory tract or even occupational asthma.

The chemicals that cause the health hazards include:

- Isocyanates contained in screen adhesives to attach screen printing mesh onto printing frames, and adhesives used for foil lamination for food package and book binding.
- Epoxy in some specialized adhesives.
- Resin that may be found in certain binding adhesives (Department of Labour, 1993).

1.5 Hazards of Chemicals Used in Printing

Adverse health effects related to exposure to organic solvents through inhalation and skin contact in the workplace include degreasing of the skin leading to dermatitis, irritation or sensitization of the skin and respiratory tract. Long-term health effects may be damage to internal organs such as liver, kidneys and lungs, etc. after absorption into the body. Organic solvents may also cause central nervous system depression with such effects as drowsiness, incoordination, inattention and impaired balance.

As the printing industry uses large quantities of flammable solvents and combustible materials like paper, fabric, plastics, the risk of fire is high (Occupational Safety and Health Branch, 2004).

Processes/materials	Chemicals	Potential hazards
Etching, engraving, plate-making, certain photographic reproduction systems, correction of litho-plates (using hydrofluoric acid)	Corrosive acids (e.g. concentrated nitric and sulphuric acids, hydrofluoric acid)	<ul style="list-style-type: none"> • Skin burns and blisters • Burns with concentrated hydrofluoric acid are very severe • Eye damage
Concentrated photographic developer solutions	Hydroquinone	<ul style="list-style-type: none"> • Irritating to eyes

		<ul style="list-style-type: none"> • Irritating or sensitizing to skin, may cause dermatitis
Photographic fixer solutions	Acetic acid, acidic salt solutions (e.g. sodium thiosulphate)	<ul style="list-style-type: none"> • Irritant
Hardener added to photographic fixer solutions	Dilute formaldehyde solution	<ul style="list-style-type: none"> • Irritant • Frequent contact may lead to skin sensitization
Making flexographic and letterpress plates	Perchloroethylene	<ul style="list-style-type: none"> • Dizziness, drowsiness and other effects on the central nervous system
Adhesive laminating; Use of polyurethane lacquers	Isocyanate pre-polymers	<ul style="list-style-type: none"> • Irritation of respiratory and gastrointestinal tracts • Occupational asthma • Dermatitis • Lacrimation
Handling, cutting, grinding lead type, hot metal work	Lead dust/fume	<ul style="list-style-type: none"> • Acute intoxication leading to an encephalopathic syndrome (i.e. gross ataxia, repeated vomiting, lethargy, stupor, convulsions, headache, hallucinations, tremors and coma)

		<ul style="list-style-type: none"> • Chronic intoxication leads to weight loss, central and peripheral nervous system effects and anaemia
Use of UV lamps for photo processing, UV curing, corona discharge	Ozone UV radiation	<ul style="list-style-type: none"> • Irritation of eyes, upper respiratory tract • Headaches and nausea • Skin burns, ocular irritation to varying degrees which may cause difficulty with vision
Dyeline printing	Ammonium hydroxide	<ul style="list-style-type: none"> • Irritation of respiratory tract (as ammonia vapour)
Digital (ink-jet) printing	Methyl ethyl ketone (MEK), propanol	<ul style="list-style-type: none"> • Fire hazard • Dermatitis • Dizziness, drowsiness and other effects on the central nervous system
Lithographic printing: fountain solution, blanket restorers	Isopropyl alcohol (IPA), methyl ethyl ketone (MEK)	<ul style="list-style-type: none"> • Fire hazard • Dermatitis • Dizziness, drowsiness and other effects on the

		central nervous system
Spray of anti-set-off powder (to prevent wet ink from transferring from the top of one sheet to the bottom of the next sheet)	Sugar/starch dusts	<ul style="list-style-type: none"> • Irritating to respiratory tract and blocking the nose
In thermography, powder is sprinkled over wet ink and baked.	Plasticizers	<ul style="list-style-type: none"> • Irritating to respiratory tract and blocking the nose
Gravure and flexographic printing inks	Ketones (e.g. MEK, cyclohexanone); alcohols (e.g. IPA, industrial methylated spirits); esters (e.g. ethyl acetate, isopropyl acetate); aromatic hydrocarbons, (e.g. toluene, xylenes)	<ul style="list-style-type: none"> • Fire hazard • Dermatitis <p>Dizziness, drowsiness and other effects on the central nervous system</p>
Screen printing	Ketones (e.g. cyclohexanone); aromatic hydrocarbons (e.g. toluene, xylenes)	<ul style="list-style-type: none"> • Fire hazard • Dermatitis
Cleaning of screens in screen printing	Strong alkalis (e.g. concentrated sodium or potassium hydroxide)	<ul style="list-style-type: none"> • Corrosive to skin, eyes and mucous membrane
Cleaning rollers, cylinders and blanket restoring	Kerosene, white spirit (contain n-hexane); chlorinated hydrocarbons	<ul style="list-style-type: none"> • Fire hazard

	(e.g. dichloromethane); ketones (e.g. methyl ethyl ketone (MEK))	<ul style="list-style-type: none"> • Dizziness, drowsiness and other effects on the central nervous system • Peripheral poly-neuropathy (n-hexane, methyl-n-butyl ketone)
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Table 1: Summary of some commonly used printing processes and materials with their associated hazards (Occupational Safety and Health Branch, 2004)



CHAPTER TWO
LITERATURE
REVIEW

2.1 A Prospective Study of Diseases Associated with Workers in the Printing Industry in a City of Ghana.

A lack of information on the overall characteristics of work-related diseases in the printing press industry in Ghana holds back the development of effective disease prevention strategies in the industry. So a research work was conducted to identify the commonest disease conditions and factors that influence workers in the printing press industry to visit the hospital. A prospective descriptive study was conducted. Twenty randomly selected printing press houses in the Kumasi metropolis. Participants were workers of the selected printing houses; they were interviewed in simple and clear English language with pre-tested questionnaires which were administered to them in their respective printing houses. Demographic data, disease conditions and factors for hospital visitation were obtained and recorded from September-December 2010. In total, 200 participants from twenty selected printing houses in the Kumasi metropolis were interviewed using questionnaires. Females and males were 37.0% and 63.0% respectively, with the age ranges from 18 to 65 years. The three commonest disease conditions recorded were allergic dermatitis (58.5%), asthma (13.0%) and hypertension (13.0%). The most prevalent (51.0%) factor for hospital visitation was sustaining of occupational injuries during work whilst injury caused by the printing machinery: moving parts 63 (31.5%) and sharp edges 33 (16.5%) played major roles in injuries. The most common disease condition found after the study was allergic dermatitis whilst superficial injuries were a very high factor for workers to seek for health care (Agbenorku, *et al.*, 2012).

2.2 Cancer in Printing Workers in Denmark.

In 1995, Lyng, *et al.* conducted a research work on the press workers in order to study the cancer incidence in printing workers in Denmark. The result of that research work was quite astonishing. Lung, bladder, renal pelvis, and primary liver cancers were in excess among the printing workers. The excess risks of lung cancer among the factory workers in newspaper and magazine production, of bladder cancer in typographers in printing establishments, of renal pelvis cancer in typographers and lithographers, and of primary liver cancer among lithographers and bookbinders exceeded those expected based on the reported smoking and drinking habits (Lyng, *et al.*, 1995).

2.3 N-Hexane Neuropathy in Offset Printers.

A prospective, population-based study was conducted by Chang, *et al.* in 1993 on offset printer workers. The study showed that in an offset printing factory with 56 workers, 20 (36%) developed symptomatic peripheral neuropathy due to exposure to n-hexane. Another 26 workers (46%) were found to have subclinical neuropathy. The initial change in the nerve conduction study was reduced amplitude of the sensory action potentials, followed by reduced amplitude of the motor action potentials, reduction in motor conduction velocities and increase in distal latencies. These changes indicated primary axonal degeneration with secondary demyelination. Sural nerve biopsy in a severe case showed giant axonal swellings due to accumulation of 10 nm neurofilaments, myelin sheath attenuation and widening of nodal gaps. The development of neuropathy bore no direct relationship to the duration of exposure, hence factors such as individual susceptibility may be important. Optic neuropathy and CNS involvement were uncommon and autonomic neuropathy was not encountered (Chang, *et al.*, 1993).

2.4 A Register-Epidemiology Study on Cancer among Swedish Printing Industry Workers.

The Swedish Cancer Environment Registry, a population-based Cancer Registry, had been supplemented with 1960 census data on occupation and industry. This information system was used to generate hypotheses on occupational high-cancer-risk groups and to discuss some methodological problems connected with register epidemiology. By successive exclusion of parts of the original population of printing industry workers with excess risks of lung and cervical cancer it was possible to consider similarities and differences between subgroups. Risk estimates from three different standardization methods agreed well for populations with more than 50 cases. Regional adjustment helped arrive at interpretable risk estimates. The excess risk of cervical cancer disappeared when gainfully employed persons and blue-collar workers were used for reference. After the exclusion procedure there was an excess risk of lung cancer among typographers and lithographers in printing enterprises, especially in some birth-cohorts, due possibly to working exposure environment (Malker & Gemne, 1987).

2.5 The Prevalence of Occupational Dermatitis in the UK Printing Industry.

To quantify occupational ill health resulting from dermatitis in the UK printing industry and to explore links with particular processes and activities a survey was conducted by Livesley, *et al* in 2002. Approximately 2600 members of the Graphical, Paper and Media Union living in Nottinghamshire were sent a self-completion questionnaire. A sample of respondents, both those who reported current skin problems and those who did not, were invited for a short dermatological examination. The overall response rate was 62%. A total of 1189 respondents were directly involved in the printing industry and categorized according to work in pre-press (25%), printing (46%), or finishing (42%) processes. A total of 490 respondents (41%) self-reported having a skin complaint at some time. Prevalence was highest in males (43%) and those working in printing (49%), in particular those who cleaned rollers and cylinders or who came into contact with substances containing isocyanates on a daily basis. The most commonly affected areas reported were the fingers and webs between the fingers. Twenty-six per cent of the 490 reported a current problem on the hand. Reported symptoms included itching (61%), rash (58%), and dry skin (56%). Although certain printing industry substances were thought by respondents to aggravate their condition, constant washing and friction was most often cited. Reported use of protective equipment and cleansing products was generally high, particularly by printers. Clinical examination confirmed the high self-reported prevalence and also identified a substantial proportion of mild cases which were not reported. The overall prevalence of occupation ally related skin complaints was estimated to be 40% (Livesley, *et al.*, 2002).

2.6 Risk of Bile Duct Cancer Among Printing Workers Exposed to 1,2-Dichloropropane and/or Dichloromethane.

A retrospective cohort study was conducted to examine the risk of bile duct cancer among current and former workers in the offset color proof printing department at a printing company in Osaka, Japan. Standardized incidence ratios (SIRs) between January 1, 1985, and December 31, 2012, were estimated for the cumulative years of exposure to two chemicals, dichloromethane (DCM) and 1,2-dichloropropane (1,2-DCP). Among 106 workers with a total of 1,452.4 person-years of exposure, 17 bile duct cancer cases were observed, resulting in an estimated overall SIR of 1,132. (95% confidence interval). The

SIR was 1,319. (95%) for those who were exposed to both DCM and 1,2-DCP, and it was 1,002.8 (95%) for those exposed to 1,2-DCP only. SIRs tended to increase according to years of exposure to 1,2-DCP but not DCM when a 5-year lag time was assumed. The SIRs were higher for the cohorts in which observation started in 1993-2000, particularly in cohorts in which it started in 1996-1999, compared with those in which it started before or after 1993-2000. They observed an extraordinarily high risk of bile duct cancer among the offset color proof printing workers. Elevated risk may be related to cumulative exposure to 1,2-DCP, but there remains some possibility that a portion of the risk was due to other unidentified substances (Sobue, *et al.*, 2015).

2.7 Traumatic Injuries among Printing Press Workers in Kumasi, Ghana.

There were no records on printing press injuries; this phenomenon holds back the development of effective occupational hazard prevention strategies in Ghana. The objective of this study was to identify the prevalence rate, types, causes of traumatic injuries and the level of education on work safety of workers in the printing industry. Respondents were workers of 20 selected printing houses in the Kumasi metropolis; they were interviewed in simple and clear English language with pre-tested questionnaires which were administered to them in their respective printing houses. The prevalent rate of traumatic injuries was 67% (134/200). The most common recorded type of injuries was superficial (62.7%) and lacerations (19.4%). The most common causes of injuries were those involving the printing machinery (48.5%). Majority of the respondents (65.0%) had knowledge on health safety measures. Training and knowledge about the work was high among Kumasi printing house workers. Despite this, traumatic injury prevalent rate was high. Knowledge on preventive health and safety education must be enforced (Agbenorku, *et al.*, 2010).

2.8 Contact Dermatitis in Printing Tradesmen.

During a 2-year period in Toronto, Canada, 21 printing tradesmen with contact dermatitis were evaluated. 67% had allergic contact dermatitis; 29% due to Ultraviolet-Cured ink components Irritant contact dermatitis accounted for 37% of the cases. The prognosis in printing tradesmen with contact dermatitis was guarded, except for those with allergic

contact dermatitis due to UV-cured components, as the tradesmen who were sensitized to other contactants eventually left the trade. Offset lithography was associated with the problem in 18 of the 21 cases (Nethcott and Nosal, 1986).

2.9 An Epidemiological Investigation of Cancer of the Bladder.

Wynder *et al.* (1963) examined occupation and other risk factors associated with urinary bladder cancer risk in 300 male and 70 female cases and an equal number of controls from seven New York hospitals in 1957-61. Controls, matched by age and sex, were selected among patients of the same hospitals excluding subjects with cancers of the respiratory system and of the upper alimentary tract and those with myocardial infarction. Information on possible risk factors was collected through interviews. Three cases had ever worked as printers, engravers or lithographers (Wynder *et al.*, 1963).

2.10 Occupational Risk of Colon Cancer.

The association between lung cancer risk and occupation was studied in a case control study in Missouri, United States (Brownson *et al.*, 1989). Study subjects were identified through the Missouri Cancer Registry. Cases were all white male Missouri residents who had been diagnosed with histologically confirmed lung cancer from January 1980 through to November 1985; controls were white male Missouri residents diagnosed with cancer, excluding cancers of the lip, oral cavity, esophagus, lung, urinary bladder, ill-defined sites and unknown sites. The study involved 4431 cases and 11326 controls. An excess of adenocarcinoma was found for printing occupations, odds ratio, 1.8 (Brownson *et al.*, 1989).

Significance of the Study

Press industry is a total chemical based industry. Workers in this industry have been exposed to different chemical factors like organic solvents, mineral oils, pigments, resins, lead, and paper dust through both inhalation and dermal contact. The major printing-factory hazard is exposure to the solvents in inks, thinners, clean-up materials, and so forth. Solvent exposure in offset establishments included white spirits, methylene chloride, isopropanol, 1,1,1-trichloroethane, ethanol, and trichloroethylene (Webjørnse, S. 2000).

The greatest hazard is exposure through inhalation, causing narcosis (dizziness, headache, nausea, and light-headedness) from acute exposure and skin, liver, kidney, reproductive, and nervous system damage, with repeated exposures. Skin absorption can also produce these effects. The International Agency for Research on Cancer (IARC) classified occupational exposure in the printing industry as possibly carcinogenic to humans and the reported studies did show excesses of lung cancer and bladder cancer and the exposures of interest were considered to include many potential carcinogens. Increased risks have also been detected for melanoma and cancers of the buccal cavity and pharynx and pancreas. The US prevalence of asthma in adults by industry of employment, the prevalence, and ORs were significantly elevated for printing, publishing, and allied industries. Several studies have shown a correlation between airborne pollutants and respiratory disorders in which exposure to the latter type of industrial pollutants is associated with a significantly higher prevalence of allergic respiratory diseases (Decharat, 2014).

There are several studies conducting on press workers in different countries around the world like UK, Norway, Denmark, Ghana etc. There is no significant work in our country regarding this topic. One of the major reasons for choosing this topic for the study was to identify the current health condition of the press workers in our country. Like other countries, Bangladesh has a prominent press industry. It is a developing industry. But there are not any specific rules and regulations for the safety of the workers. The prime objective of this study is to identify the most common disease conditions and factors that influence workers in the printing press industry to visit the hospital.

Aims and Objectives of the Study

The aims and objectives of this study were to:

- Estimate the ratio of male and female workers, their educational status, number of workers in different departments,
- Determine their current health status, common diseases of them, common physical symptoms which are showed by the workers,
- Estimate the major accidental incidents,
- Observe the awareness regarding their health and work safety.



CHAPTER THREE
METHODOLOGY

3.1 Type of the Study

It was a survey based study.

3.2 Study Area

The survey was conducted in different presses in different areas inside Dhaka City.

3.3 Study Population

In this study, a total number of 250 press workers were surveyed with a questionnaire in order to assess the associated disease conditions and factors that influence workers of randomly selected printing houses. Informed consent was obtained from the eligible participants before interviewed and participants who agreed to join the study provided the required information for the studies.

3.4 Study Period

The duration of the study was about eight months starting from January to October in 2015.

3.5 Questionnaire Development

The pre-tested questionnaire was specially designed to collect the background demographic data and the detailed exposure information. The questionnaire was written in simple English in order to avoid unnecessary semantic misunderstanding. The questionnaire was pilot tested to ensure it was understandable by the participants. Extra space was however, allowed after some questions for the participants' comments; and in most cases, these were used as qualifying remarks which aided considerably in giving answers to specific questions and in providing additional information which assisted the interviewers in drawing up conclusions.

3.6 Sampling Technique

In this study purposive sampling was followed.

3.7 Data Analysis

After collecting, the data were checked and analyzed with the help of Microsoft Excel 2013. The result was shown in bar, pie and column chart and calculated the percentage of the health status and associated disease conditions and factors that influence workers.



CHAPTER FOUR

RESULT

4.1 Age Distribution of the Workers (N=250)

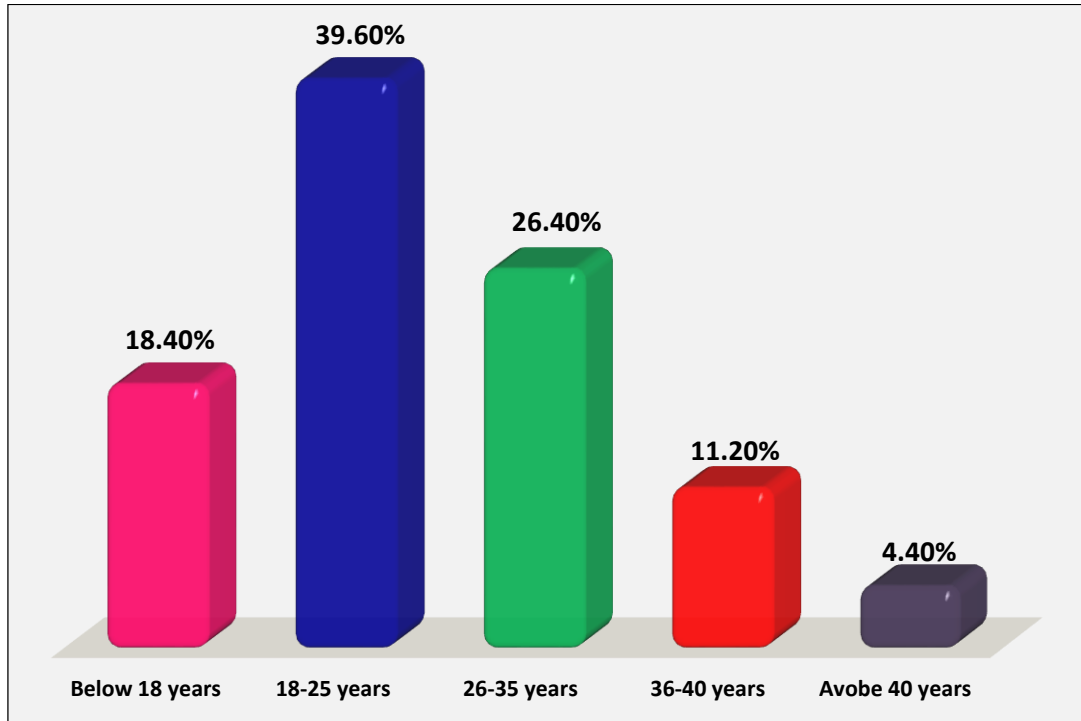


Figure 4.1: Age Distribution of the Workers

During this study it was found that about 40% of workers were in between 18 to 25 years, whereas, 27% of the workers were within the range of 36 to 40 years. However, only 4% workers were above 40 years of age.

4.2 Gender Distribution of the Workers (N=250)

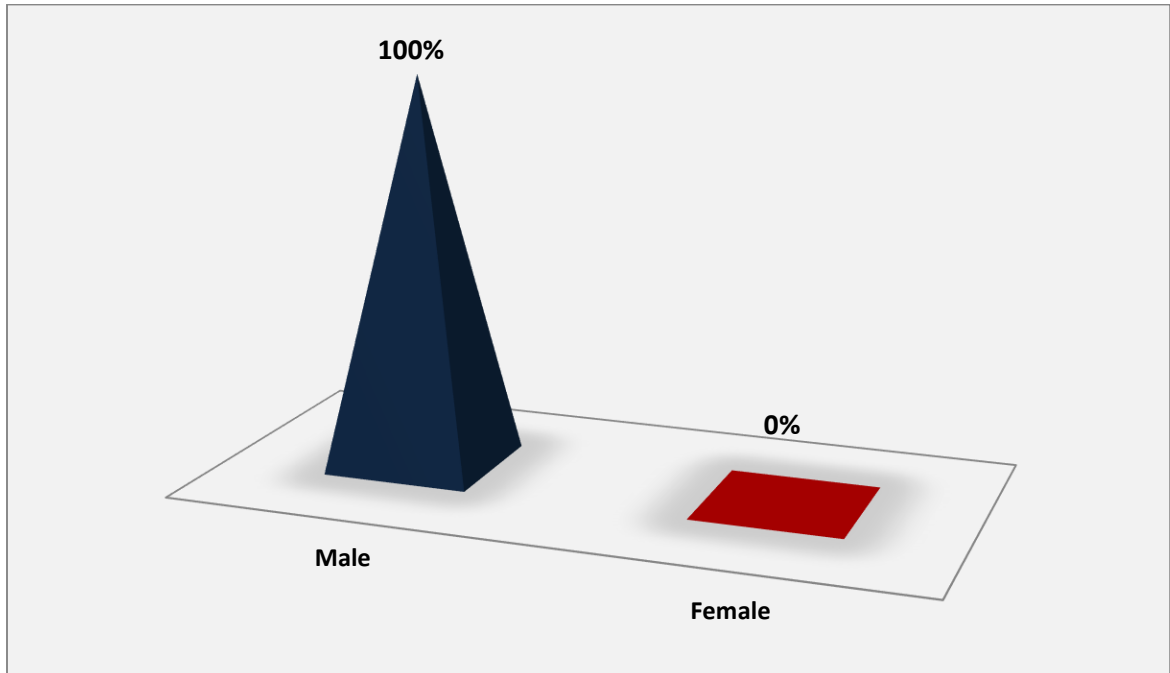


Figure 4.2: Gender Distribution of the Workers

From the graphical representation above, it can be concluded that printing industries of Dhaka are male dominated industries, as 100% workers were male.

4.3 Educational Qualification of the Workers (N=250)

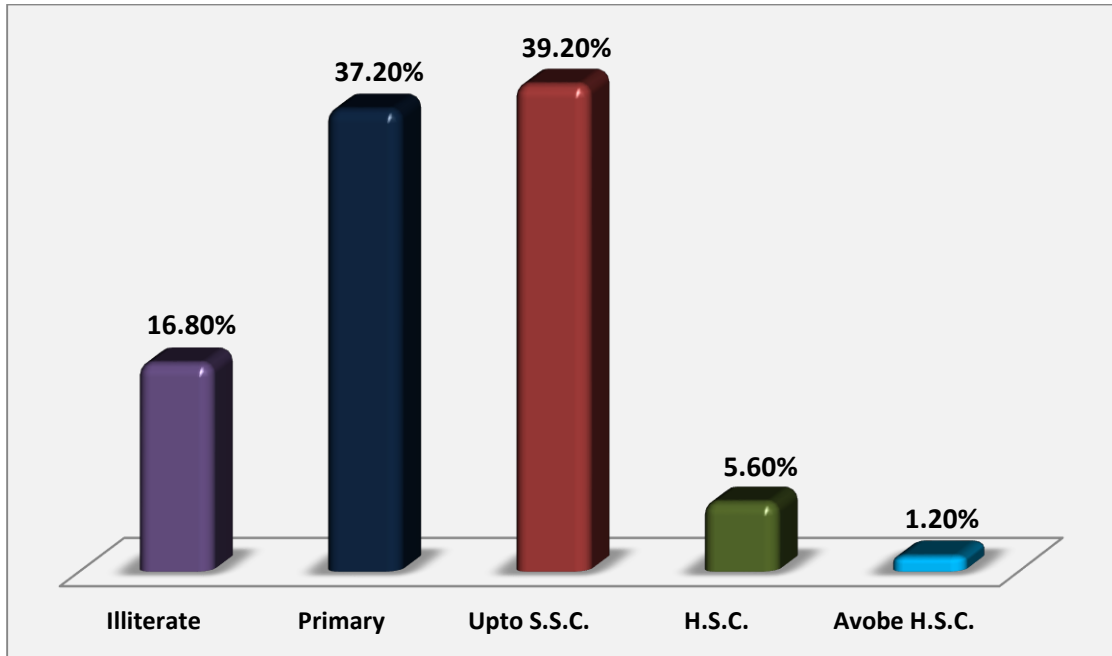


Figure 4.3: Educational Qualification of the Workers

Among 250 workers, 39.20% of them completed their education up to S.S.C level whereas 37.20% worker only completed their primary education. 16.80% workers don't have any kind of institutional education. Only 5.60% of workers completed their H.S.C. and a very few, only 1.20%, continued their studies after H.S.C.

4.4 Department of Working of the Workers (N=250)

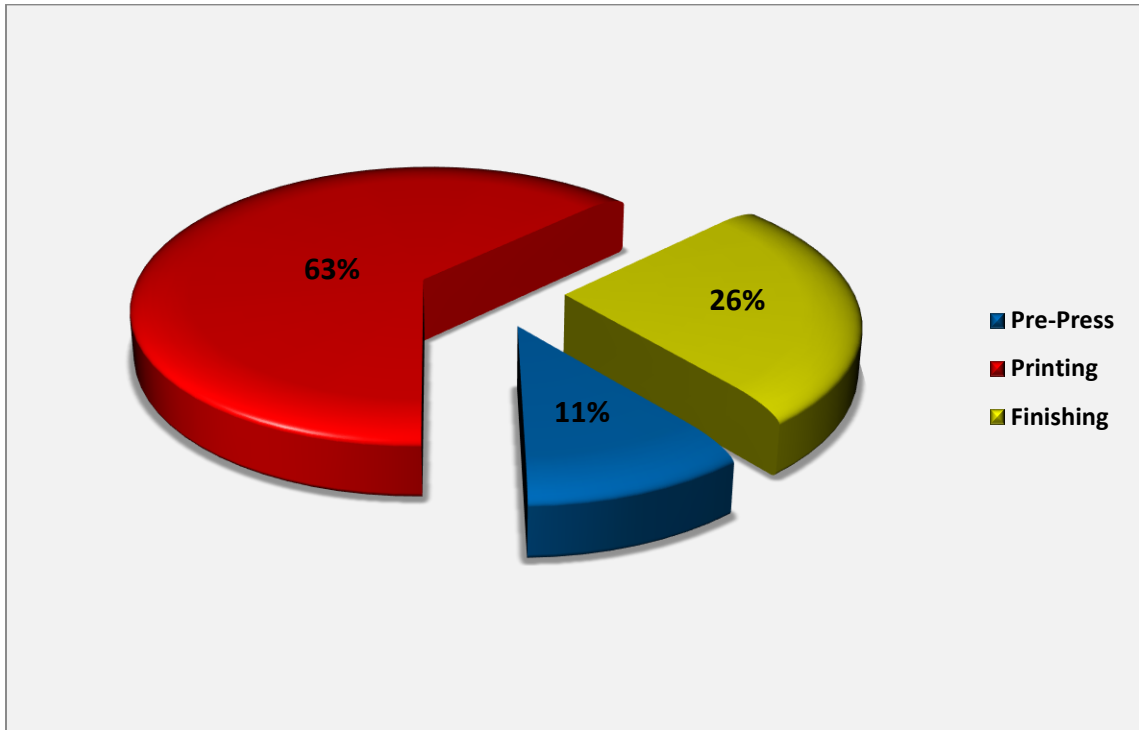


Figure 4.4: Department of Working of the Workers

There are three major departments in the press industry. During the study, it was found that 63% of the workers were occupied in the printing department, whereas, 26% workers were working in the finishing department and only 11% workers were involved in pre-press working.

4.5 Working Year(s) of the Workers (N=250)

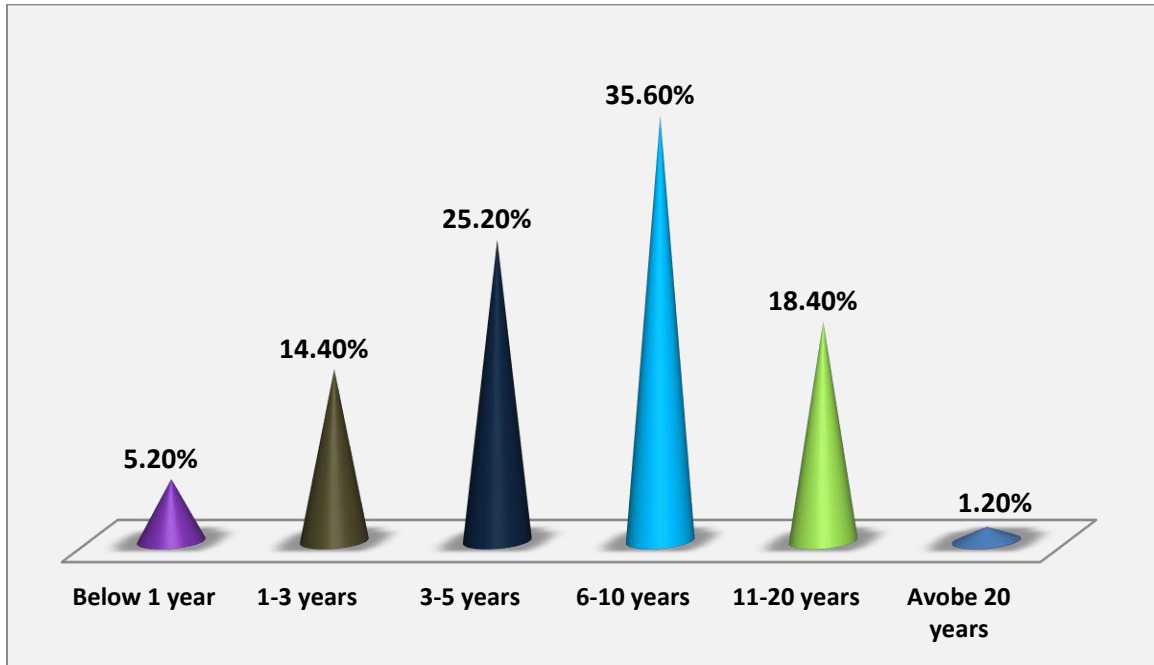


Figure 4.5: Working Year(s) of the Workers

Most of the workers (35.60%) had in between 6 to 10 years of working experience. While 25.20% workers carried an experience of 3 - 5 years, only 5.20% workers were working for less than 1 year. Experience of above 20 years is the rarest, with only 1.20% workers holding it.

4.6 Duration of Working of the Workers (N=250)

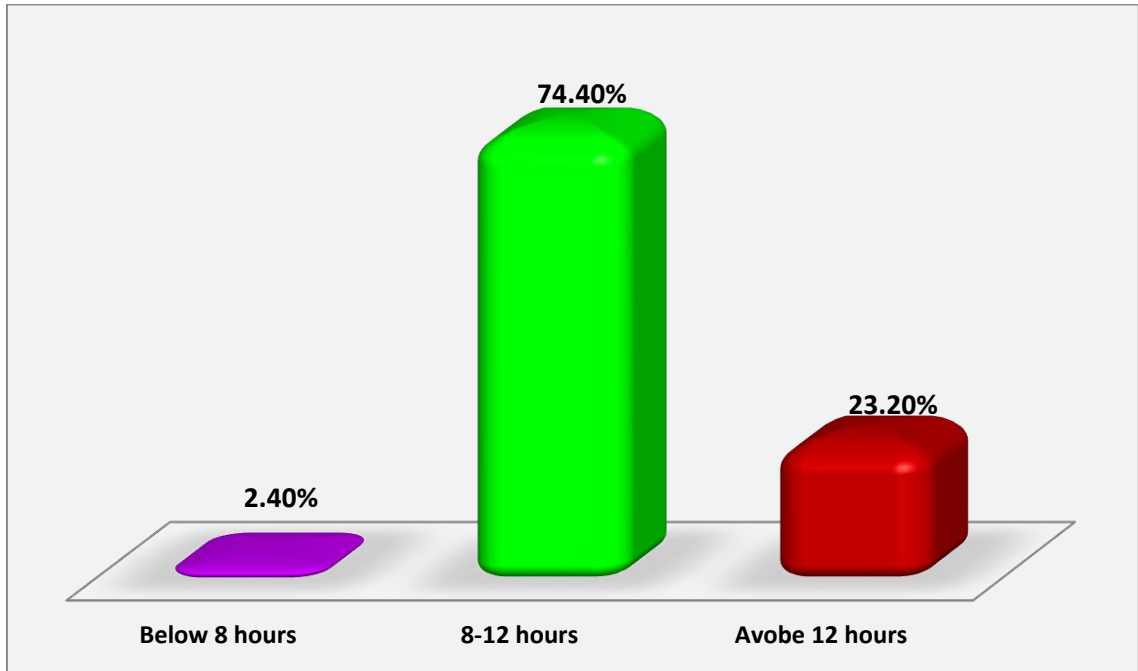


Figure 4.6: Duration of Working of the Workers

It was seen that, among 250 workers, majority of the workers i.e. 74.40% worked for 8 to 12 hours every day. On the other hand, 23.20% of workers worked above 12 hours, and 2.40% of them worked below 8 hours.

4.7 Overtime

4.7.1 Overtime Done by the Workers (N=250)

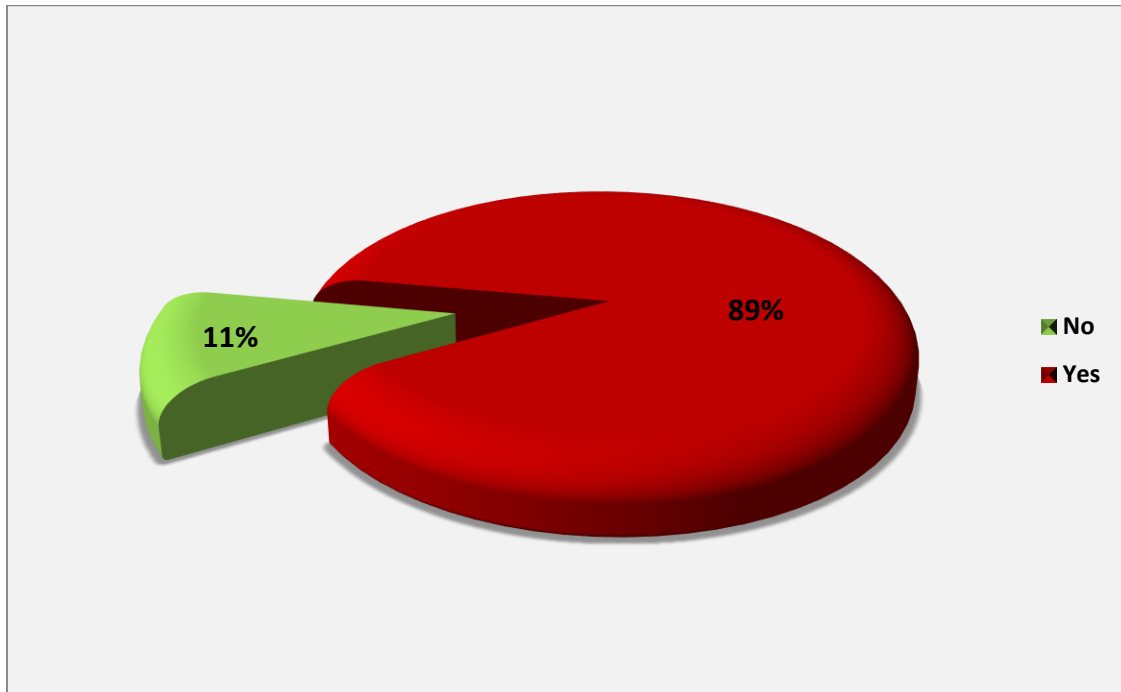


Figure 4.7.1: Overtime Done by the Workers

Working overtime is quite common in the press industry. Consequently, 89% of the workers had to work overtime. However, the rest of the workers i.e. 11% of the working population didn't have to do any overtime work.

4.7.2 Frequency of Overtime Done by the Workers in A Week (N=228)

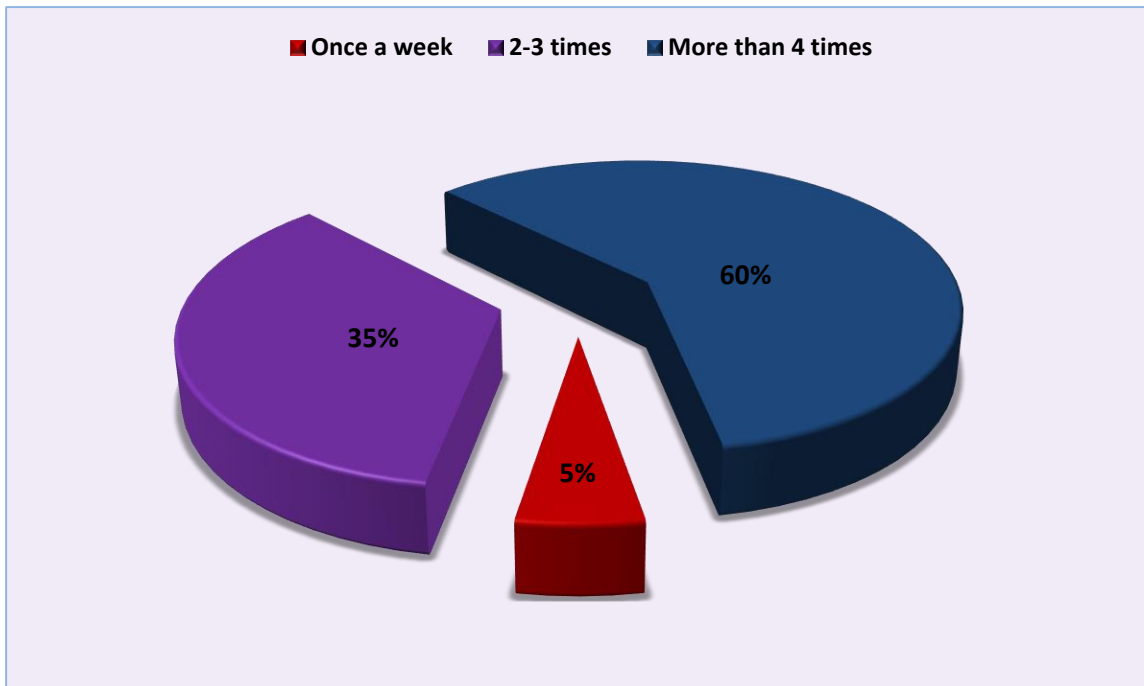


Figure 4.7.2 Frequency of Overtime Done by the Workers in A Week

Among 228 workers, 60% did overtime more than 4 times a week. 35% of them said that they had to do it 2 to 3 times a week. And only 5% did overtime once a week.

4.8 Workers Suffering from Any Disease at Present

4.8.1 Distribution of Workers Suffering from Any Diseases at Present (N=250)

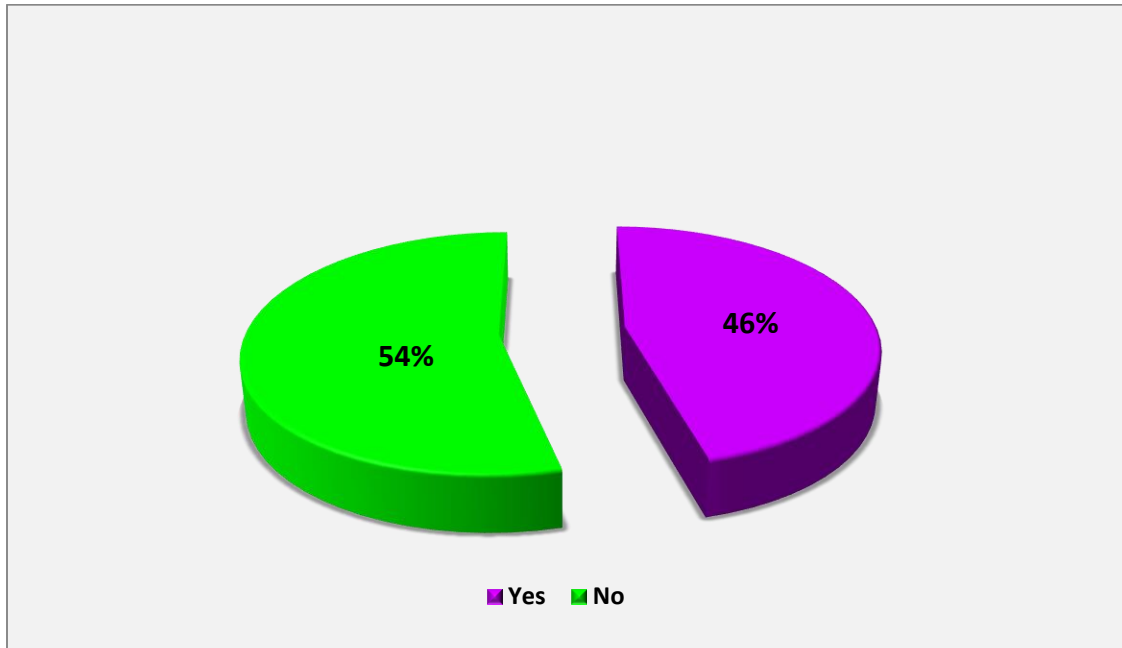


Figure 4.8.1: Distribution of Workers Suffering from Any Diseases at Present

It was found that 54% of them didn't have any kind of disease conditions or symptoms, whereas, 46% of them were positive with different disease conditions and symptoms.

4.8.2 Types of Diagnosed Diseases from Which Workers Were Suffering at Present (N=115)

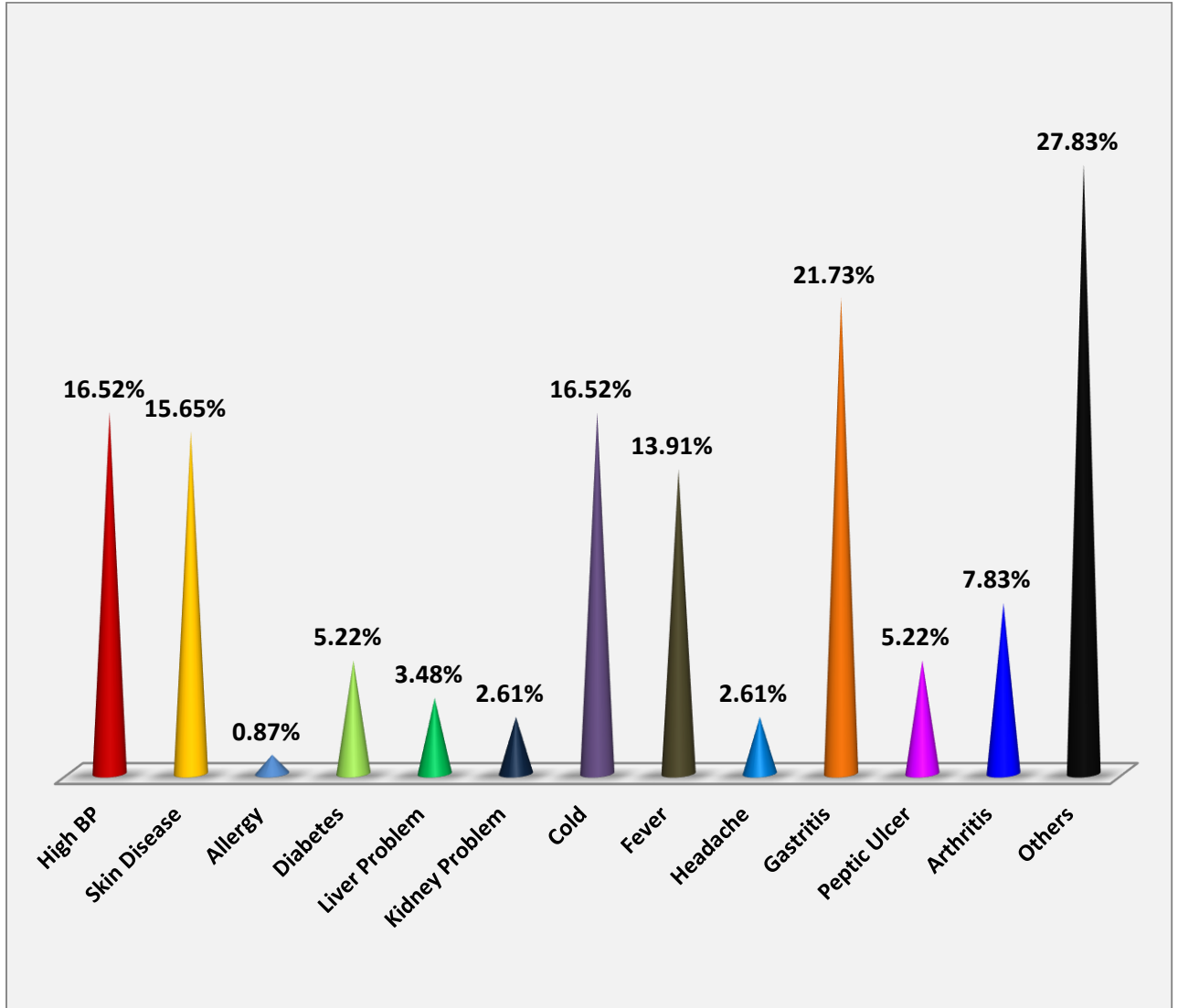


Figure: 4.8.2: Types of Diseases from Which Workers Were Suffering at Present

As mentioned earlier, 45% workers were diagnosed of different kinds of diseases. It was observed that the most suffered disease was gastritis, whereas the least suffered was allergy, their ratios being 21.73% and 0.87% respectively. Furthermore, 16.52% were suffering from high blood pressure. The ratio of workers suffering from cold was also the same. Additionally, 15.65% were suffering from skin disease. Lastly, 27.83% were suffering from other kinds of diseases which includes joint pain, inflammation in mouth, migraine, hypercholesterolemia, UTI etc.

4.9 Medication Intake by the Workers (N=250)

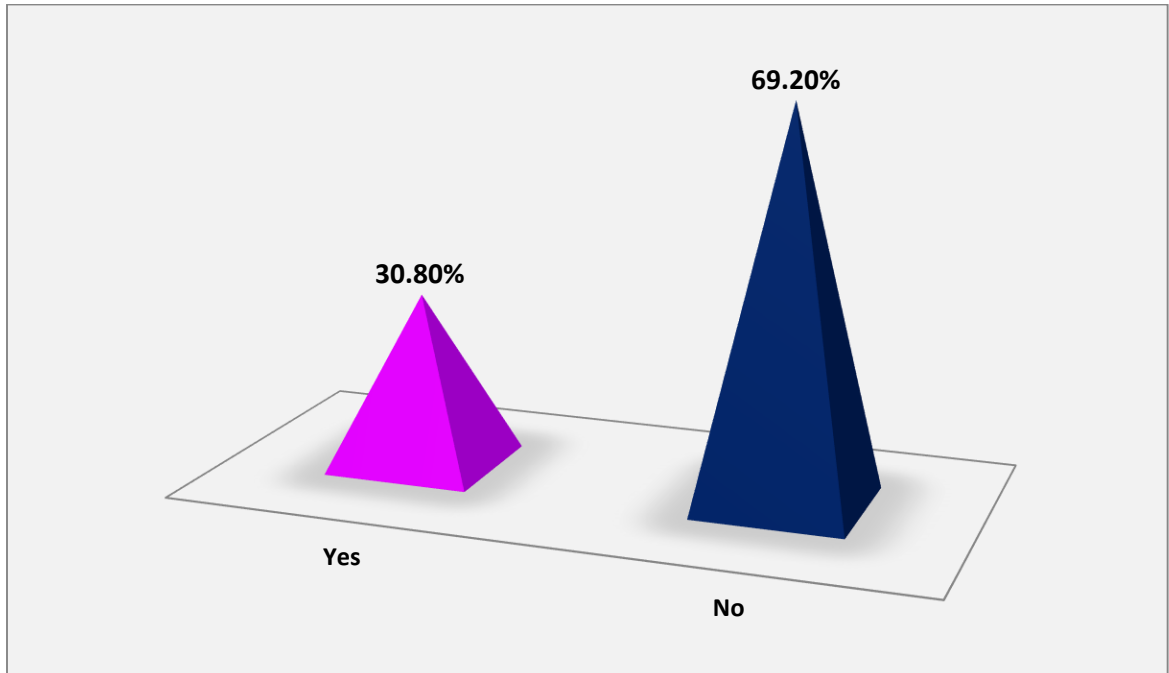


Figure 4.9: Medication Intake by the Workers

It can be summarized that among 69.20% of the workers didn't take any type of medications whereas 30.80% of them are taking different kinds of medications in accordance to their disease conditions.

4.10 Smoking Habit of the Workers (N=250)

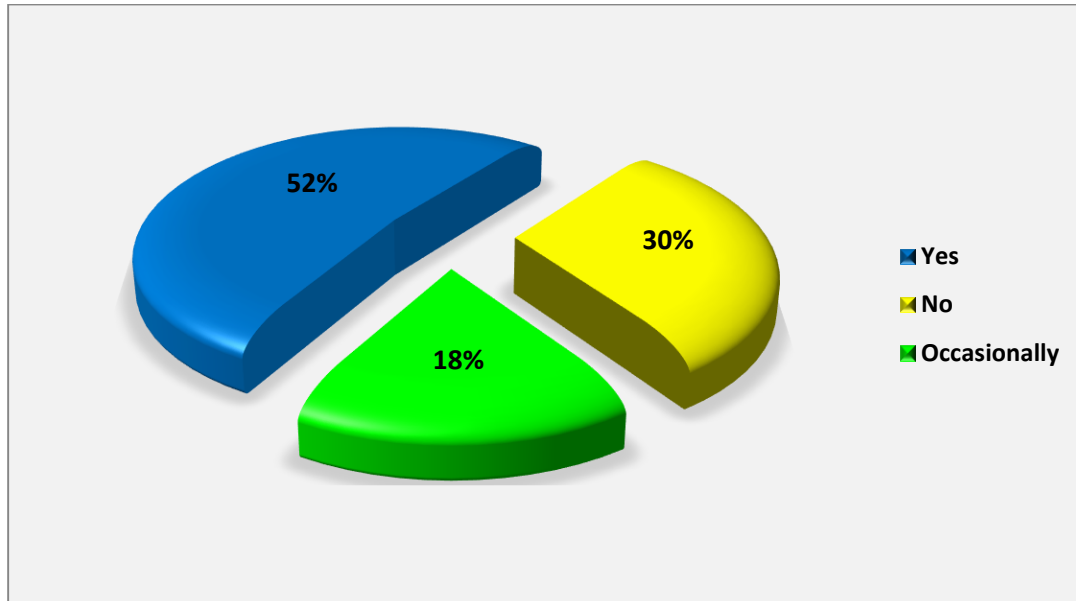


Figure 4.10: The Smoking Habit of the Workers

It was found that 52% of the workers were chain smokers whereas 18% of them smoked occasionally. The rest of the workers i.e. 30% didn't have the habit of smoking.

4.11 Physical Symptoms Present in Workers (N=250)

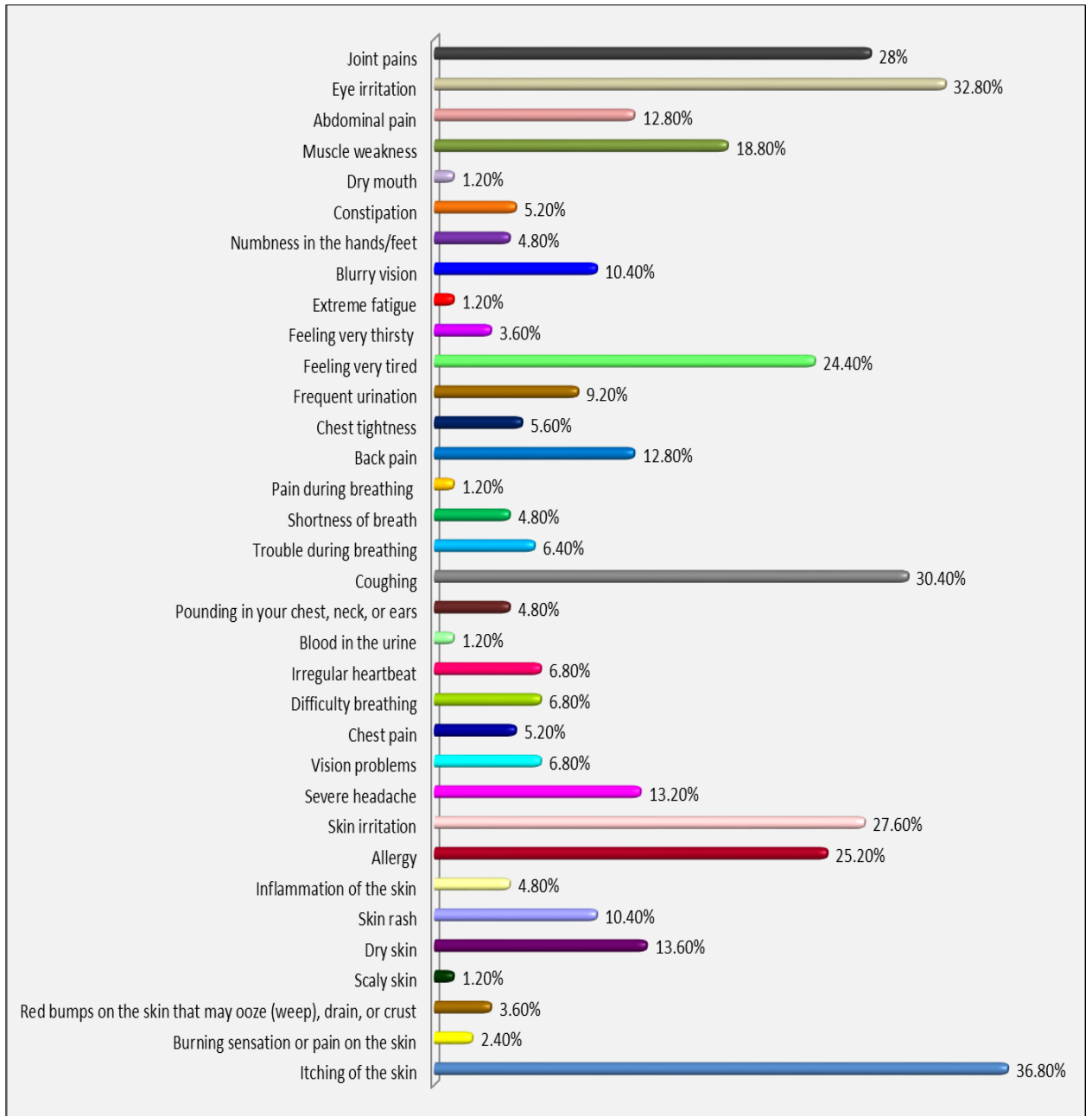


Figure 4.11: Physical Symptoms Present in Workers

It was found that 36.80% of the workers had itching of the skin, 27.60% of them had skin irritation, 25.20% had allergy, 13.60% had dry skin, 10.40% had skin rash, 4.80% had skin inflammation, 3.60% had red bumps on the skin that may ooze (weep), drain or crust, 2.40% had Burning sensation or pain on the skin and 1.20% had scaly skin.

Moreover, other major symptoms included eye irritation (32.80%), coughing (30.40%), joint pains (28%), feeling very tired (24.40%). Among the minor symptoms, abdominal pain (12.80%), back pain (12.80%), difficulty in breathing (6.80%), shortness of breath (4.80%), blood in the urine (1.20%) etc.

4.12 Injury

4.12.1 Injury Experienced by the Workers (N=250)

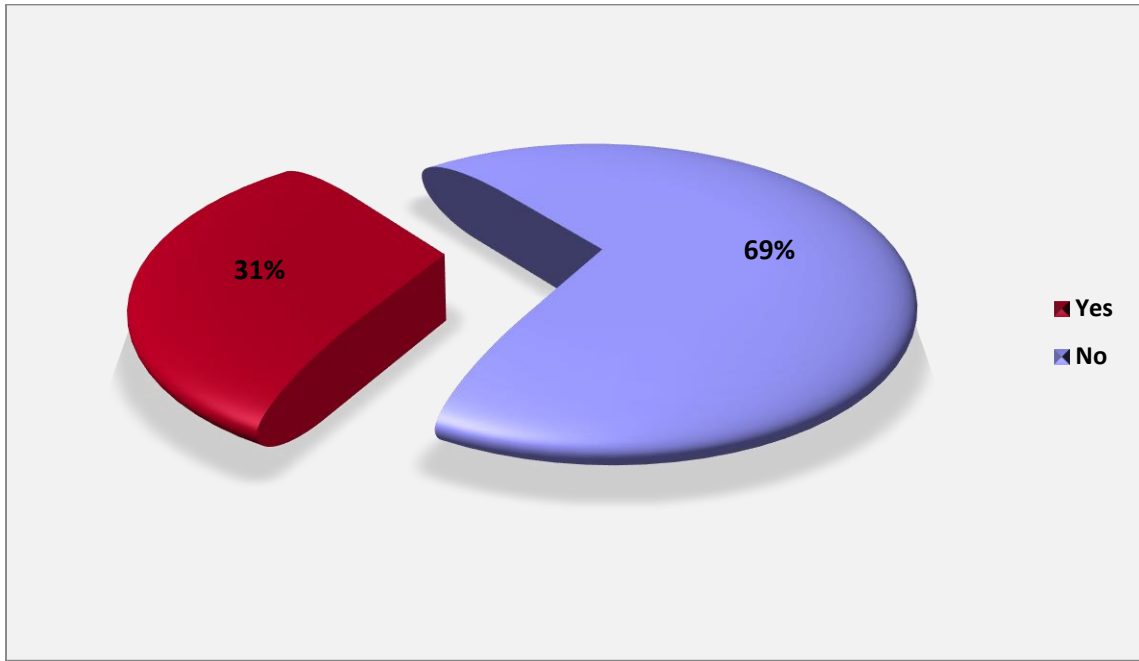


Figure 4.12.1: Injury Experienced by The Workers

It was observed that among 250 workers, 69% of them didn't suffer from injury during their work. On the other hand, 31% i.e. 81 workers have suffered from some kind of injuries during their work.

4.12.2 Reasons of Injury (N=81)

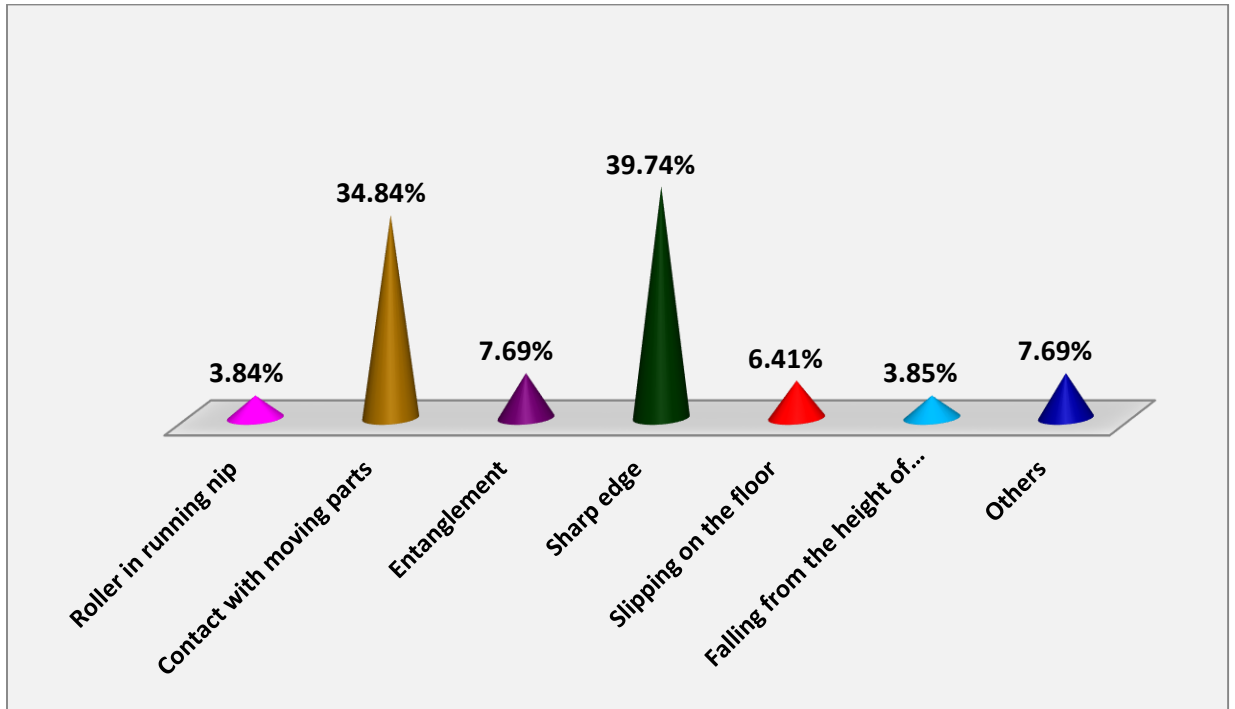


Figure 4.12.1: The reasons behind the injuries

Among the 81 workers who had suffered from work injuries, 39.74% injured themselves by sharp edge. 34.84% were injured by moving parts, 6.41% were injured by slipping on the wet floor, 3.85% were injured by falling. Lastly, 7.69% were injured by some other ways.

4.13 Doctor Facility Available in the Press (N=250)

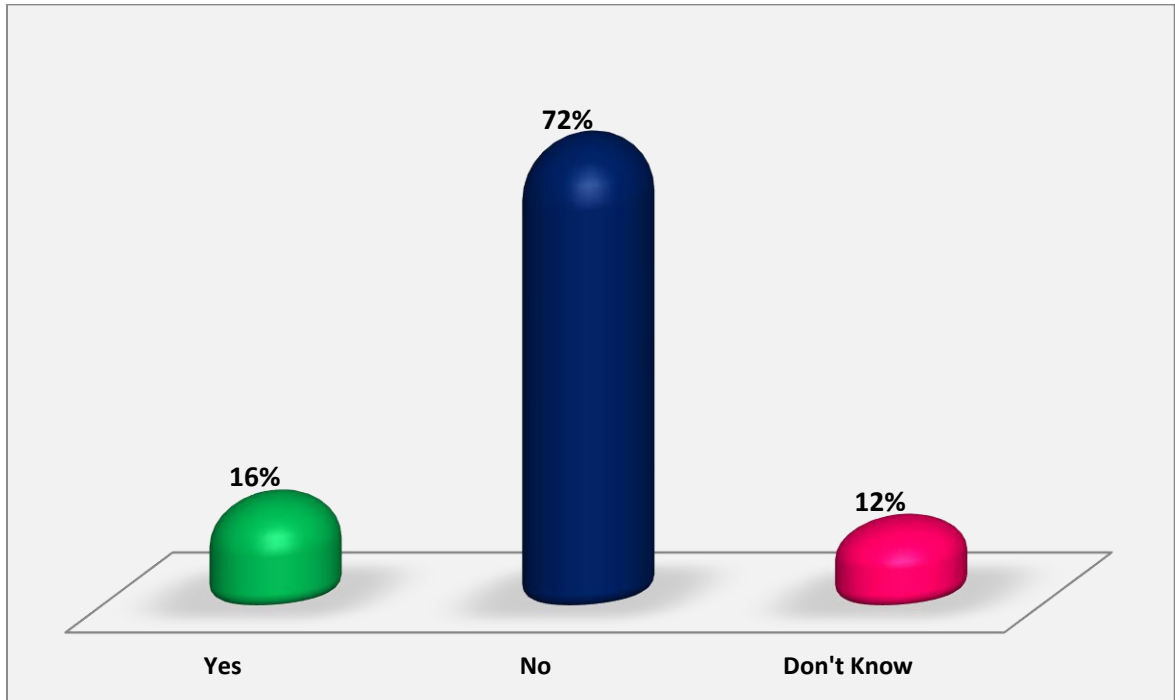


Figure 4.13: Doctor Facility Available in the Press

It was observed that 72% of 250 workers said that there was no doctor facility available in the press, 16% said that they had doctor facility and 12% of them said that they didn't know whether any doctor facility was present in their press.

4.14 First Aid Kit Available in the Press (N=250)

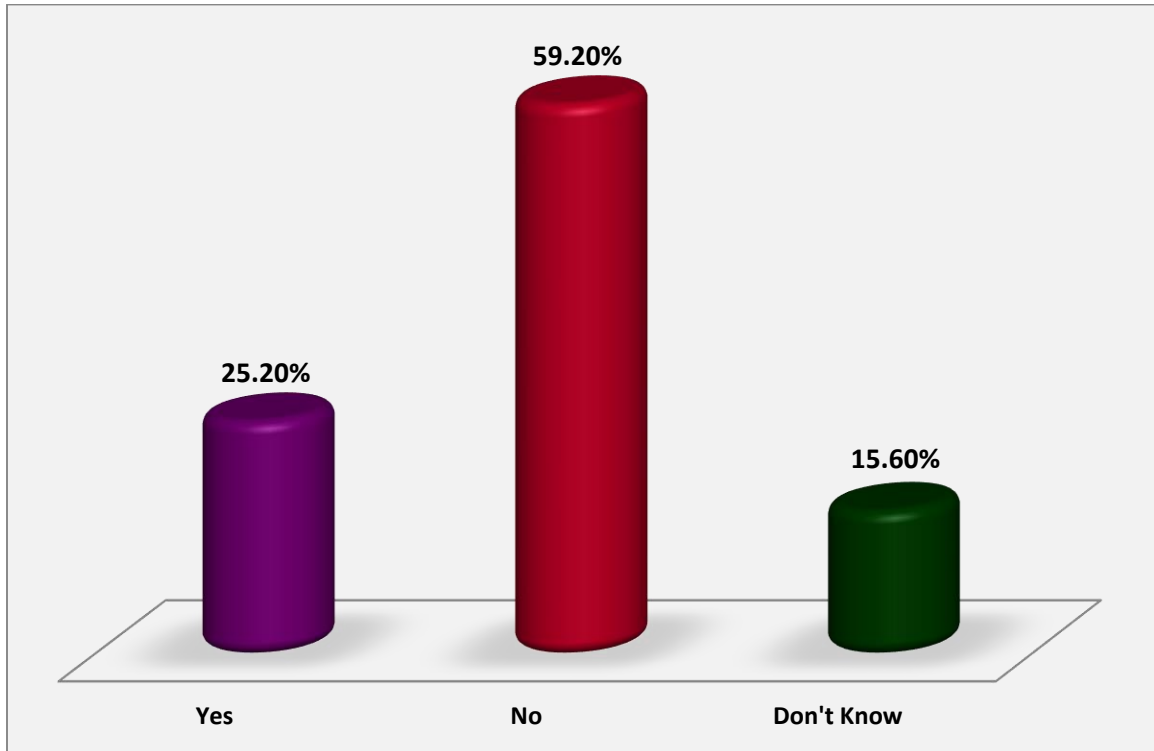


Figure 4.14: First Aid Facility Available in the Press

It is determined that 59.20% workers said that there was no first aid kit available in the press whereas 25.20% said they had first aid kit in their press and 15.60% didn't know anything about it.

4.15 Visit to Health Care Professionals

4.15.1 Distribution of Workers Visit to Health Care Professionals (N=250)

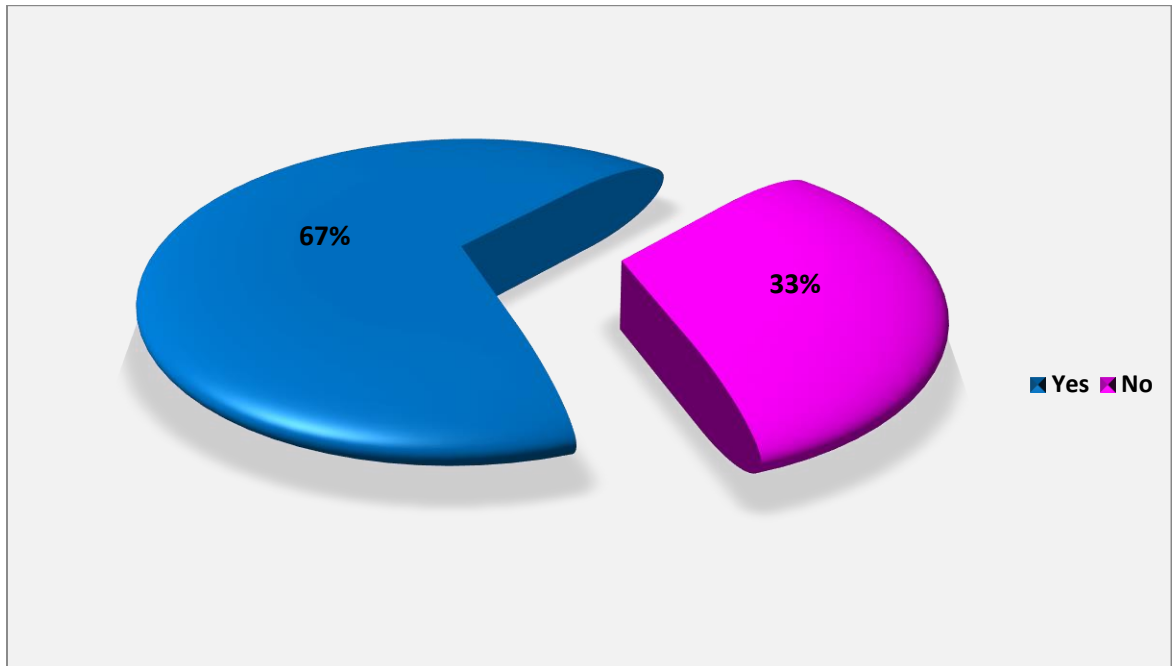


Figure 4.15.1: Distribution of Workers Visit to Health Care Professionals

During the survey, it was found that 67% of total worker had seek some sort of help from the health care professionals and 33% didn't seek for any kind of assistance.

4.15.2 Reason for Visiting to Health Care Professionals (N=168)

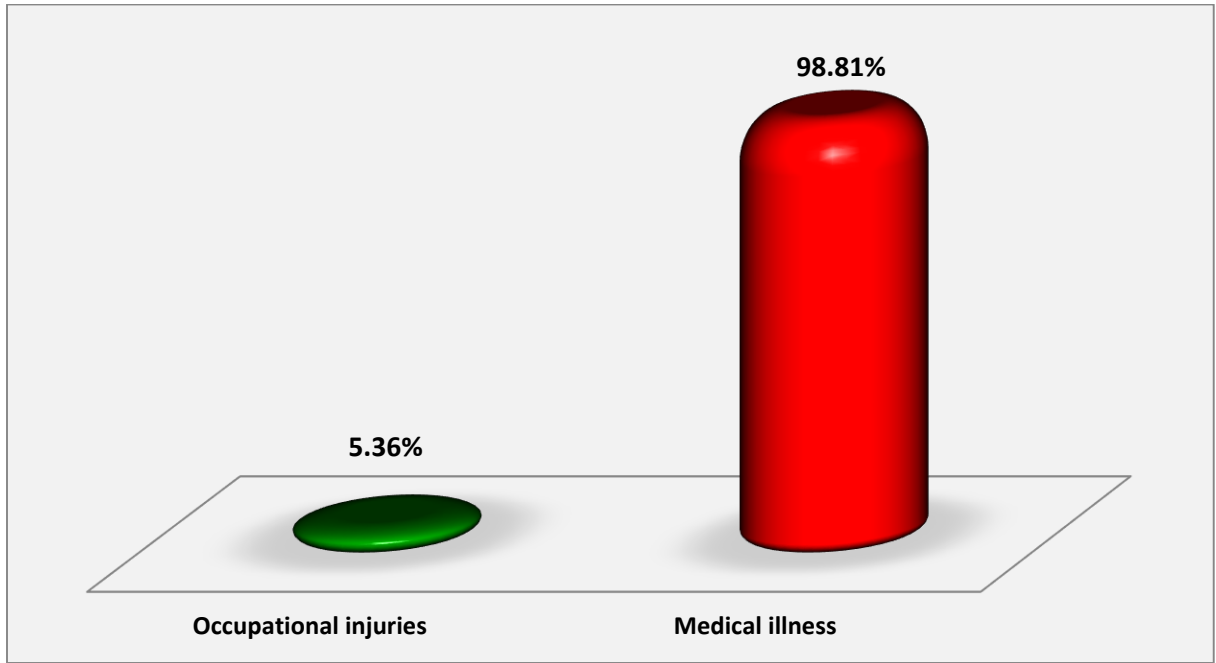


Figure4.15.2: Reason for Visiting to Health Care Professionals

Among the 67% i.e.168 workers who said that they had seek help from health care professionals, the main reason of their seeking help was medical illness and its percentage is 98.81%. On the other hand, 5.36% workers were asked for help for occupational injuries.

4.16 Last Visit to Health Care Professionals (N=250)

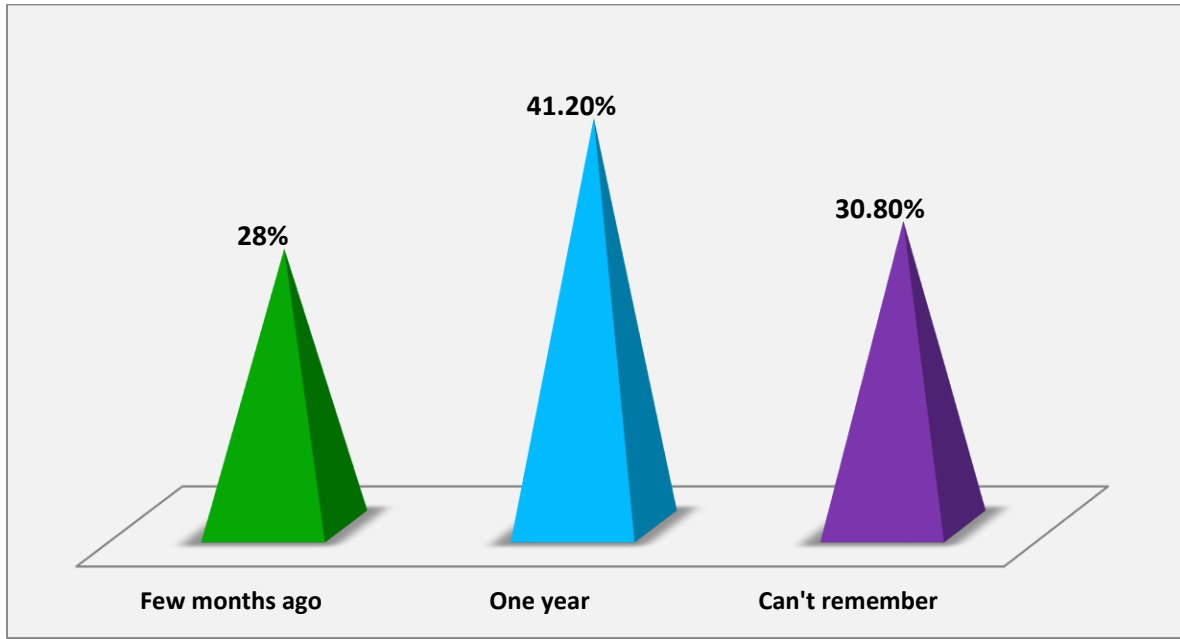


Figure 4.16: Last Visit to Health Care Professionals

From the above diagram, it can be said that 41.20% of workers visited to health care professionals about a year ago, 28% went there few months ago and 30.80% were not able to recall their last visit.

4.17 Necessity of Regular Health Checkup

4.17.1 Distribution of Workers Feeling the Necessity of Regular Health Checkup

(N=250)

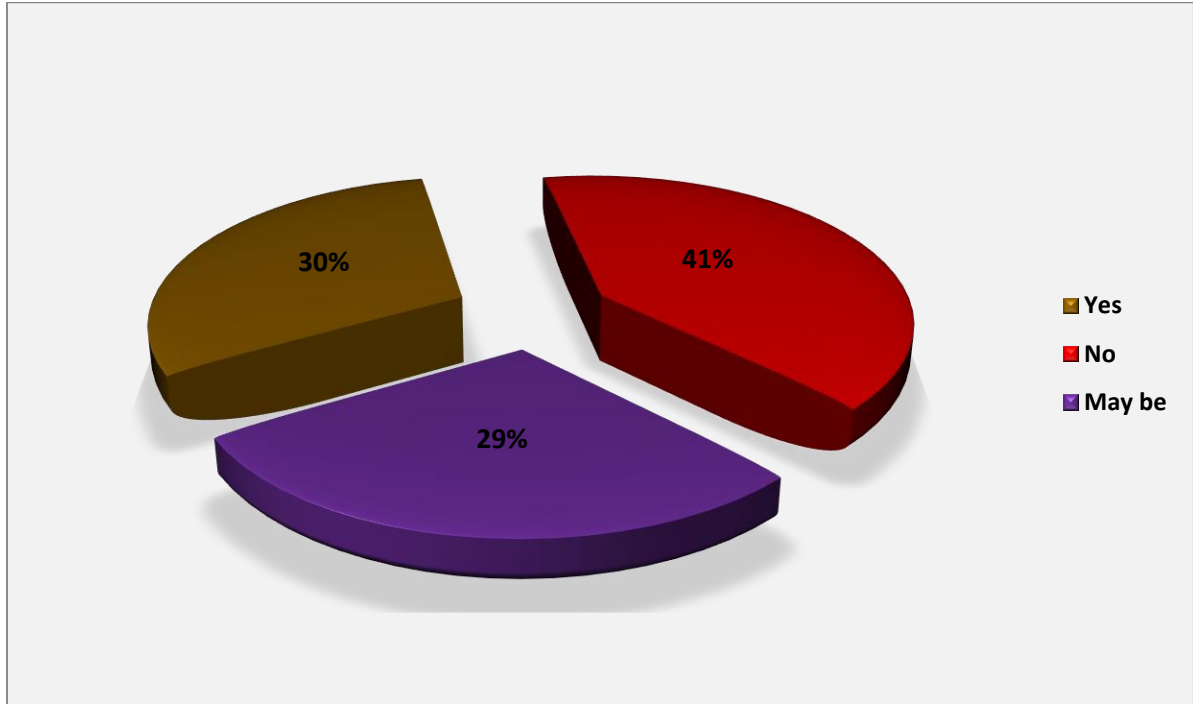


Figure 4.17.1: Distribution of Workers Feeling the Necessity of Regular Health Checkup

Among 250 workers, 41% of them didn't feel any necessity of regular health checkup, whereas 30% believed that regular health checkup is necessary. 29% weren't sure about the necessity of it.

4.17.2 Reasons for Not Feeling Necessity of Regular Health Checkup (N= 82)

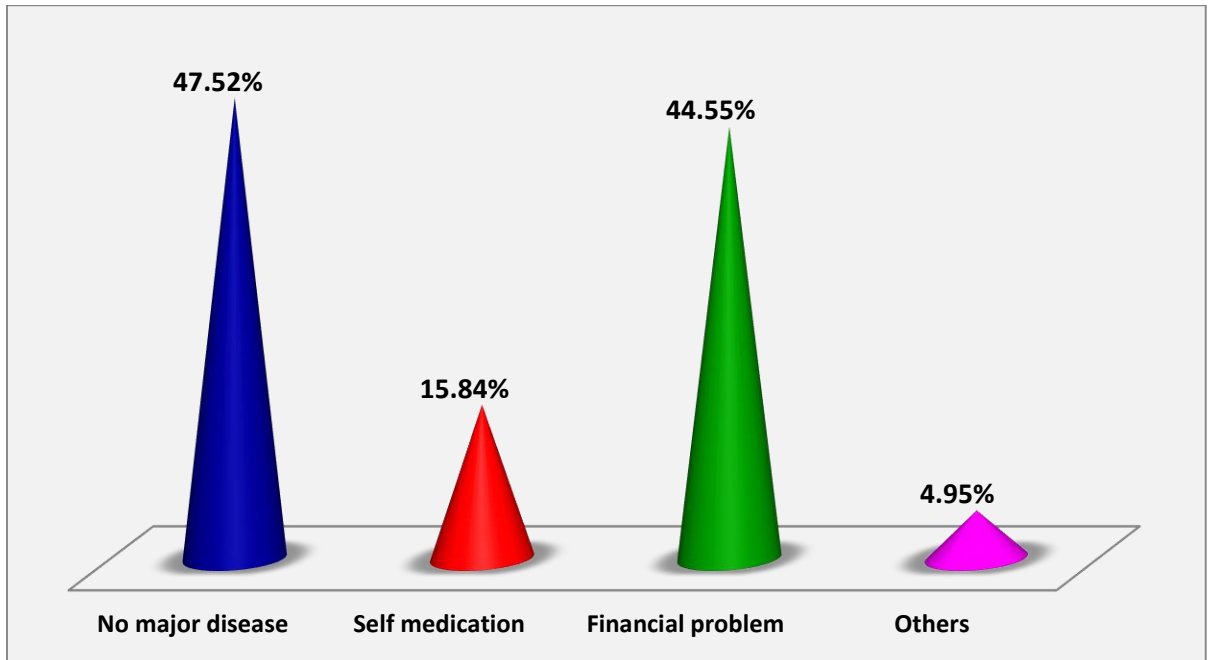


Figure 4.17.2: Reasons for Not Feeling Necessity of Regular Health Checkup

Among the 82 workers, who said they didn't feel any necessity of regular health checkup, 47.52% of them said they didn't have serious diseases at that moment, 44.55% had financial problem, 15.84% of them performed self-medication and 4.95% had some other reasons.

4.18 Use of Safety Protective Measures by the Workers (N=250)

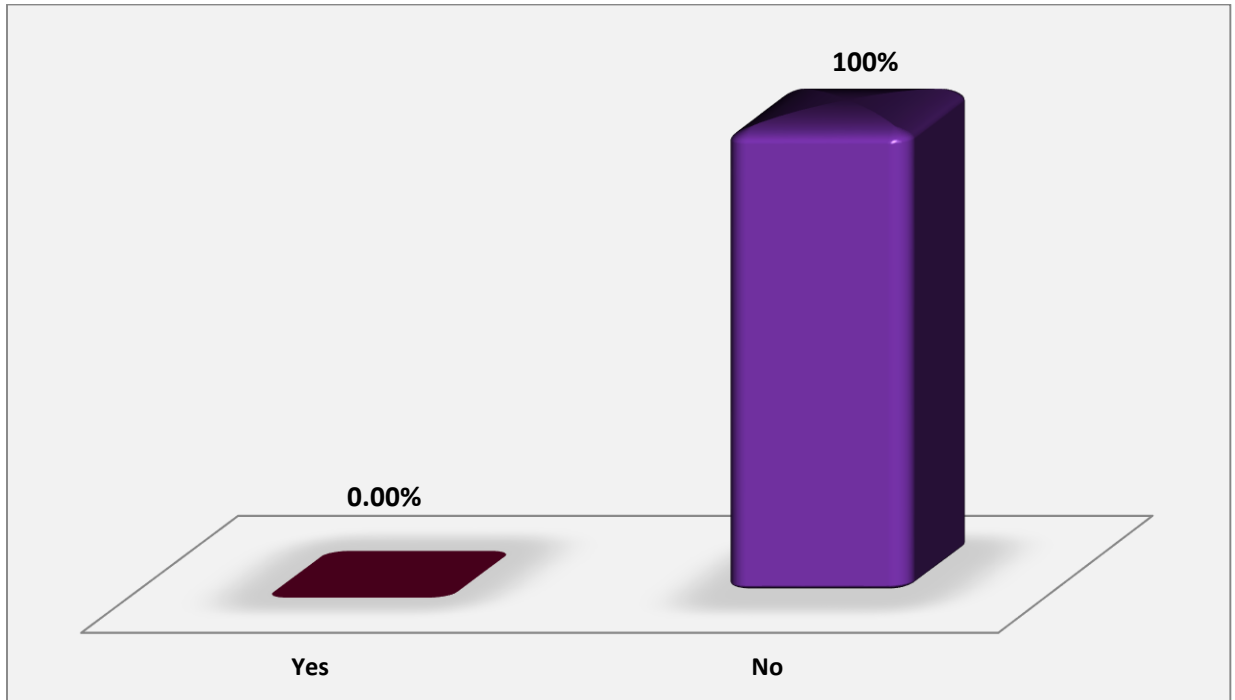


Figure 4.18: Use of Safety Protective Measures by the Workers

During the survey work, it was found that no protective measures were used by any of the workers.

4.19 Training on Safe Performance of Tasks by the Workers (N=250)

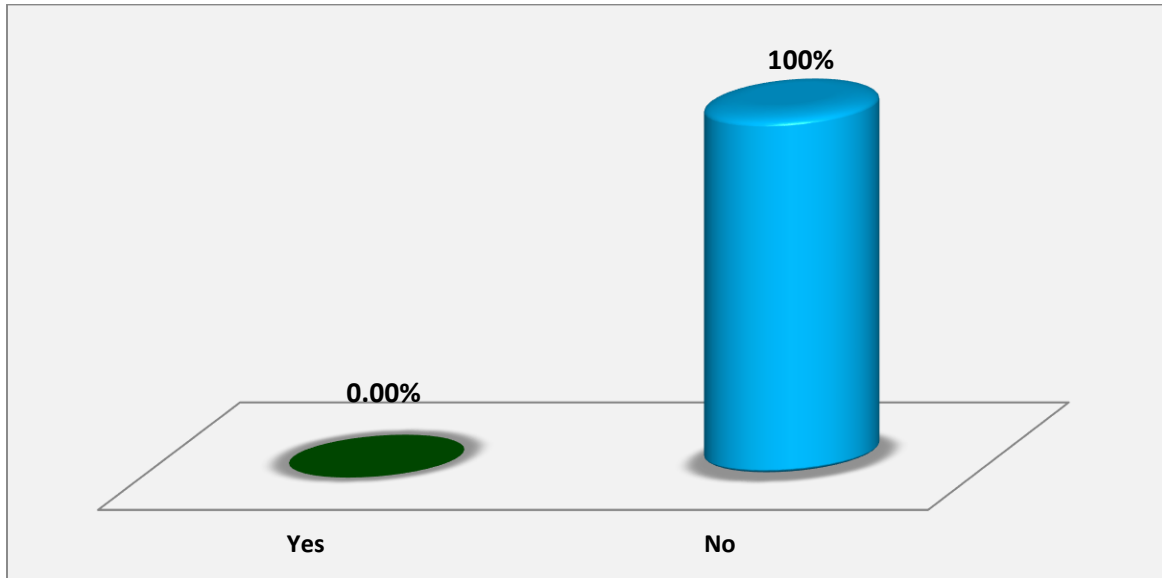


Figure 4.19: Training on Safe Performance of Tasks by The Workers

Among 250 workers, there wasn't a single worker who had any prior training on safe performance of tasks.



**CHAPTER FIVE
DISCUSSION &
CONCLUSION**

Discussion

Press industry, despite being an inextricable part of a society, is still underdeveloped in Bangladesh. Since it is still developing, it is yet to reach perfection. Consequently, various flaws are visible in this industry. Since printing requires extensive amount of coloring, chemical usage is one of the main requirements of this industry. Due to which, the main objective of this study is to identify the present condition and the environment of the place of work and its impact to the health and wellbeing of the workers.

The results obtained as a result of this study showed that presently press industries in Dhaka city are mainly male dominated. This contradicts with research conducted by Agubenorku *et al.* (2010) on Ghana, which stated that in the press industries, 63% of the workers are male, and the rest female (37%).

It was further seen that 37.20% workers joined the industry after their primary education and 39.20% workers completed their study up to S.S.C, which indicates that the workers most likely start working at an early age. This with the research of Agubenorku *et al.* (2010) on Ghana, which showed that most workers in the press industry holds either Senior High School qualification (35%), which is equivalent to the H.S.C in Bangladesh, or Technical/Vocational training (32.5%). In this study, it was also seen that workers with high qualifications were seen rarely to be working in this industry.

After joining the press, most workers start as an assistant in the printing department, where they usually help the senior operators. In this study, highest portion (63%) of workers were found in the printing department. The study of Agbenorku *et al.* (2010) & Livesley *et al.* (2002) had followed similar trend where the percentage of workers in printing department were respectively 40% and 46%.

After several years, the workers generally switch their jobs and moves to another sector. For this reason, 35.6% of the workers had work experience of 6 to 10 years.

Overtime is a common occurrence in this industry. In this study it has been found that almost 89% of the workers had to do overtime and among them around 60% of the workers had to do more than 4 overtimes in a week, which causes a serious stress and different physical problems.

The main concern of this study was to find the health condition and the disease status of the workers working in the press. Workers in the printing industry suffers from different kinds of diseases. In this study, it was found that 54% of the workers are suffering from different kinds of diseases at that time. Gastritis is the most common disease found in the workers. Among 115 workers 21.73% were suffering from it. After it, High BP, cold, different types of skin diseases, and cold is quite common. There percentages are 16.52%, 16.52%, 15.65% and 13.91% respectively.

If the symptoms from the result of this study is examined, it can be seen that, skin related symptoms are quite common among the workers in printing department. Printing department is the department where the workers come in contact with different types of chemicals including potential skin irritants i.e. alcohols, alkalis, developers, etching solutions, greases, waxes, and inks; and contact allergens such as potassium dichromate, dyes, formaldehyde, hydroquinone glues, and gums frequently. According to the results obtained, 36.80% had itching of the skin, 27.60% of them had skin irritation, 25.20% had allergy, 13.60% had dry skin, 10.40% had skin rash. These are the main symptoms of allergic dermatitis. Agbenorku *et al.* (2010) concluded that, allergic dermatitis is the most common (58.5%) disease. Nethercott and Nosal (2006) illustrated a similar pattern. Eye irritation and coughing due to the chemicals were also very common symptoms among the workers in the printing industry.

As mentioned earlier, workers had to work for a longer period everyday which has a negative impact on their health. Consequently, many of the workers are suffering from joint pains (28%), feeling very tired (24.40%), muscle weakness (18.80%), severe headache (13.20%), abdominal pain (12.80%), , blurry vision (10.40%). Also symptoms such as chest pain (5.20%), shortness of breath (4.80%), trouble during breathing (6.40%), coughing (30.40%) are visible, which, without proper medical attention, might result in asthma.

Despite 67% workers visiting the doctor due to various medical illness (98.81%), and despite having the aforesaid symptoms, there seems to be a lack of awareness and interest towards seeking regular medical checkup, with 41% of the workers showing absolutely no interest in seeking medical assistance and 29% still doubtful of the necessity of it. Reasons

for this lack of awareness and doubt were informed to be mostly financial problem (44.55%) and thought of absence of any major disease (47.52%). Some informed the reason to be practice of self-medication (15.84%). If measures are not taken to increase this awareness regarding regular medical assistance, this crisis might take form of different chronic diseases.

Agbenorku *et al.* (2010) opined that occupational injuries are quite common among the press workers. As they dealt with different machineries, sharp objects and chemicals. Merk *et al* (2006) and Sorock *et al* (2001) confirmed that mechanical equipment of machinery parts predominates the causes of traumatic injuries. But in this study, only 31% of the workers had some experience of any kind of injury which is very lower compared to other studies. Contact with moving parts and sharp edges are the frequent reasons of injury.

For treating any kind of injury, there should be a doctor or at least a first kit available in the press. In this study it was seen that only 16% of the workers know about the doctor and only 25.20% of the workers know about the presence of first aid kit which is not satisfactory at all. And the most frightening part was that no worker was using any protective measures to prevent any kind of traumatic injury or serious health condition. They also didn't have any proper training on safe performance of work.

It is, however, possible to remedy all these problem and ensure the health and safety of the workers by imposing some rules and regulations which would put a strict burden on the employers to ensure safety at work place. Some examples of such regulations being:

- The employer has a duty of care towards his employees and he is under a duty to ensure safe place and environment of work.
- No worker shall be forced to carry out any work, or any other activity which is a part of his employment, if on reasonable and proportionate grounds, a reasonable person perceives that there might exist an imminent danger to the health or safety of that worker.
- No employer shall force a worker to work with a faulty machine or instrument which may cause imminent danger to the health or safety of that worker until the aforementioned machine is either repaired or replaced.

- Every worker should be provided some protective measures to wear during their working period and the employers must ensure that the workers underwent proper training in safety measures during the work performance.
- A minimum of one doctor shall be present in the premises and there should be always a primary first aid kit available to handle the injury.
- Presses shall arrange regular health care checkup for the workers at a regular interval.

Conclusion

Based on the facts and the circumstances stated above, it can be concluded that the press workers operate at an extremely vulnerable state. Not only they are at the risk of work related injuries, but also the risk of various physical diseases is utterly high. With mostly high school education, they come to work which involves handling various harmful chemicals. However, due to their lack of professional knowledge, they are unaware and negligent of the risks they undergo every day by handling these chemicals without any proper protection and also the necessity of regular medical checkup. Consequently, they suffer from various severe diseases. At this point, the only way to remedy this crisis is to put a strict liability on the employers, in which not only the workers will get proper safety training, but also will be provided with various medical facilities and protective equipment on a regular basis. If the employers are forced to abide by such safety regulations, the risk to the workers shall diminish to a greater extent and safety shall be ensured. It is however needs to be mentioned that this research was only conducted on rather smaller Presses and not the comparatively larger ones, therefore, this result does not reflect the whole context of Bangladesh. Therefore, it is suggested that if a conclusive result of the Press Industries of Bangladesh is desired, further researches on a greater scale should be conducted.



CHAPTER SIX
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