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AWARENESS OF CHEMICAL HAZARDS AND INCIDENCE OF DARKROOM DISEASES AMONG THE STUDENTS OF A DENTAL COLLEGE: A CROSS- SECTIONAL STUDY

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Abstract

Introduction: Although there has been an advance in digital radiology, still routine radiological process follows manual processing leading to exposure of individual to various hazardous chemicals. The aim of the study is to assess the knowledge of chemical hazards and evaluate incidence of darkroom diseases among the students working in radiology department.

Material and methods- The study was a cross- sectional descriptive study and a structured questionnaire was distributed among 181 students.

Results- A total of 113 students had knowledge regarding hazards of chemical processing and among them only seventy six of the students had always taken proper safety measures before processing the x-ray films, while remaining 32.3% of students had no knowledge of chemical hazards.

Discussion- Our study also demonstrated that 54.4% of the participants were ignorant towards the chemical hazards, showing lack of awareness towards darkroom diseases.

Keywords- Radiology, chemical hazards, darkroom diseases, eye irritation, contact dermatitis.

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INTRODUCTION

As the production and use of chemicals in workplaces around the world increases, workers are at risk of hazardous chemical exposures which may be detrimental to their health. Workers around the world are facing a global health crisis due to occupational exposure to toxic chemicals[1,4].

Many of these workers lost their life following such exposures, succumbing to fatal diseases, cancers and poisonings and from fatal injuries. X-ray imaging is a common and essential procedure performed on a regular basis for diagnostic purposes all over the world. The use of X-rays is increasing rapidly with the introduction of new radiation oriented therapeutic practices. Although it carries significant diagnostic benefits, extensive exposure to X-ray imaging has been shown to be associated with multiple dose-dependent health risks. Darkroom technicians and assistants are exposed daily to x-ray processing chemicals[1,2]. These chemicals contain known irritants which can cause certain disease to its handlers. Image processing chemicals help to convert latent images formed on radiographic films to visible images[2].

The chemicals convert the silver halides which are part of the emulsion coating on radiographic films to silver ions and metallic silver. The two major components of the processing chemicals are the developers and the fixers, which may either be in powdered or liquid form[3,7]. These chemicals contain hydroquinone, sulphur dioxide, glycols, ammonium chloride, glutaraldehyde, formaldehyde and acetic acid .The constituents of the processing chemicals are known irritants and could cause or exacerbate symptoms such as headache, skin rashes, asthma, nasal and pharyngeal irritation, sore throat, shortness of breath, runny nose and cough in humans.[4] These symptoms are part of multiple symptoms referred to as darkroom diseases. The study aimed to assess the knowledge of chemical hazards and evaluate incidence of darkroom diseases among the students working in radiology department[5].

METHODOLOGY

This study was conducted by the Department of Oral medicine and Radiology in RKDF Dental College and Research Centre, Bhopal. The study was a cross- sectional descriptive study among the students who worked in the radiology department. Structured questionnaire was distributed among 181 students, out of which 167 students accurately responded back.

The questionnaire was validated by the ethical committee of our institution. Questionnaire was based on the knowledge of chemical hazards in processing room, any precautions taken during processing of the x-ray films, knowledge regarding darkroom diseases and experienced any of the signs and symptoms of darkroom diseases. Data was subjected to descriptive statistics and analyzed using Analysis of Variance (ANOVA). Probability value ($p<0.05$) was considered statistically significant.

RESULTS

A total of 181 questionnaire proformas were distributed and 167 proformas were returned back with a return rate of 92.2%. Forty six percent (46 %) of the respondents were males while 54% were females (figure1), among them 46.7% were final year students, 49.7% were interns and rest 0.03% were post graduate students of Oral Medicine and Radiology department. (figure 2).

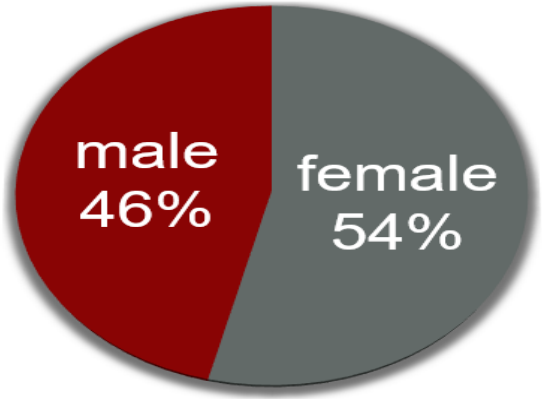

Figure 1 : Distribution of students according to gender.

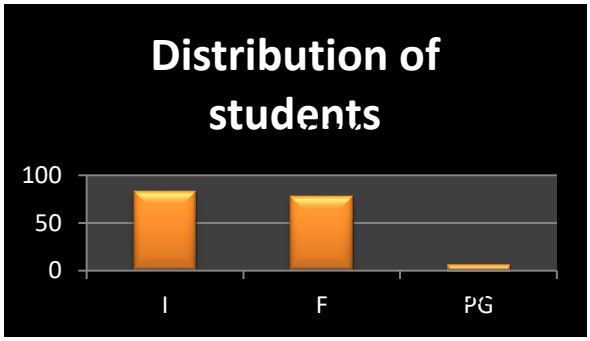

Figure 2 Distribution of students according to academic year.

A total of 113 (67.6%) students had knowledge regarding hazards of chemical processing and among them only 45.5 % (seventy six) of the students had always taken proper safety measures before processing the x-ray films, while remaining 32.3% of students had no knowledge of chemical hazards. (figure 3, figure 4)

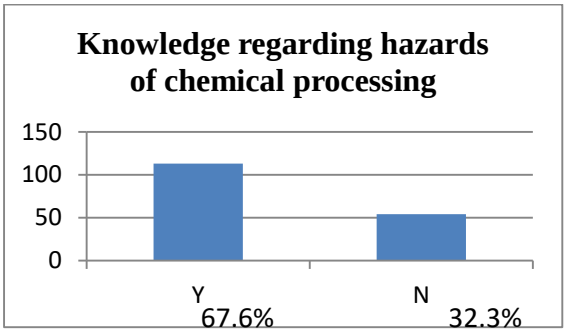

Figure 3 Knowledge regarding hazards of chemical processing

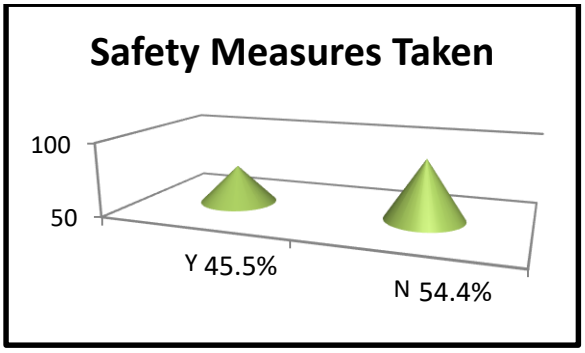

Figure 4 Safety measures taken by students

Ninety six students had experienced symptoms of darkroom diseases. The most frequently reported symptom was eye irritation (51%) followed by nasal discharge (38.5%). The least experienced symptom was headache (0.04%). Other symptoms reported were cough, contact dermatitis and nausea. (Table 1)

Table 1 Distribution of darkroom disease experienced by students

Darkroom diseases	Percentage of individual who experienced darkroom diseases
Eye irritation	51.0%
Nasal discharge	38.5%
Cough	9.3%
Contact dermatitis	7.2%
Nausea	6.25%
Headache	0.04%

DISCUSSION

A variety of chemicals are used in medical/dental imaging as developer and fixing ingredients, germicides and cleaning agents. These chemicals causes occupational diseases in exposed individual.[3,6] Poor ventilation, unsafe practices and lack of hazard recognition may contribute to various respiratory as well as dermatological diseases. Failure to

respond effectively to initial health complaints and reduce exposure levels can have serious consequences for affected employees. It is therefore important for occupational safety and health professionals to alert health facility managers to potential dangers and to recommend effective intervention strategies.[5,8,14]

Through this study, we aimed to assess the knowledge of chemical hazards during processing and evaluate the incidence of darkroom diseases among the students. Our results show that a high percentage of the study population (67.6%) was aware of chemical hazards and only 45.5% of the students had taken precautions during processing of the x-ray films. Our study also demonstrated that 54.4% of the participants were ignorant towards the chemical hazards showing lack of awareness towards darkroom diseases. In our study 57.4% of students had experienced symptoms of darkroom diseases. The most prevalent symptom noticed was eye irritation (51%) and headache was least reported. Similar findings have been reported in the literature.

A study conducted in Nigeria reported that 37% of the respondents had knowledge of constituents of processing chemicals while 68% of individuals had suffered an episode of darkroom diseases in the past.[14] Study conducted by Liss G M et al[15] had concluded that their radiographer technicians had developed chronic asthma and chronic bronchitis within seven years of exposure.

Another study conducted by Hewitt P.J[16] in 1993 stated that 39.4% of radiographer had reported symptoms such as headache, sore throat, fatigue as well as eye irritation.[15] Hamzeh Al Zabadi and Yaser Nazzal[17] in 2014 had reported that the most prominent health symptoms addressed by radiographers was headache 75.8%, throat irritation 69%, fatigue 65.5% and rhinitis 63%.[16]

Limitations of the study: Our study did not categorize the respondents based on family history of asthma or history of smoking. Our findings were based on self reported symptoms by the students and not objectively assessed by a physician. Possible reporting bias could not however be excluded.

CONCLUSION

Most of the imaging darkrooms tend to be cramped and poorly ventilated leading to development of darkroom diseases such as eye irritation, nasal discharge, cough, contact dermatitis and nausea. There are a number of effective solutions to prevent or control occupational diseases. In the Indian health services, it has been noticed that the professional staff often use clinical laboratory coats and latex examination gloves as personal protective equipment (PPE), while working in the dark room. This may be inadequate to prevent dermal contact with chemicals. The most effective means to reduce exposure to toxic chemicals in x-ray processing are proper equipment installation and adequate ventilation in the darkroom. In some cases, the physicians may help to enumerate the types of chemicals and the exposure routes which can be avoided. The environmental investigation should focus on potential design and equipment installation problems. It is important to evaluate the type of mechanical ventilation, the volumes of air exchanged, the discharge location of exhausted air and the type of chemicals used in the darkroom. Finally, it is critical that spills should be cleaned rigorously and promptly

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