ACUTE WORK RELATED EXPOSURE OF EYES OF HEALTHCARE WORKERS TO HAZARDS IN A TERTIARY CARE HOSPITAL IN SOUTH INDIA - AN OBSERVATIONAL STUDY

DISSERTATION SUBMITTED TO THE M.S. BRANCH III OPHTHALMOLOGY EXAMINATION OF THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY TO BE HELD IN MAY, 2018

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DECLARATION BY THE CANDIDATE

I declare that this dissertation entitled 'Acute work related exposure of eyes of health care workers to hazards in a tertiary care hospital in South India - an observational study' is my original work towards fulfillment of the requirements of the Tamil Nadu Dr. MGR Medical University, Chennai, for the MS Branch III (Ophthalmology) examination to be conducted in May 2018.

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1.Introduction

Occupational hazards to personnel in most industries are well documented and studied in the past(1–3). The health care industry is not immune to this by any means. As per the Census done in 2001, the Indian workforce numbered over 400 million, constituting 39.1 % of the total population of the country. Of this in 2015, Indian healthcare sector became the fifth largest employer, both in terms of direct as well as indirect employment, with an estimated total direct employment of 4,713,061 people(4)

The healthcare industry globally has been growing at unprecedented rates in the last few decades with countries like India taking a lead position and even becoming a hub of medical tourism(4). This expansion of health care industry with the rapid addition of paramedical workforce organised and unorganised, trained and untrained, to bolster the shortfall in terms of trained doctors and nurses often happens at a pace that precludes evaluation of existing occupational health policies and practices for employees. Added to this is the growing demand and prohibitive costs for health care which pushes employees to work in sometimes less than ideal working conditions eg work for longer hours than recommended for safety.

Our institution is a tertiary care institution which is well over 100 years old and has seen such a growth from its early humble beginnings of less than a 100 employees to nearly 10000 currently. To recognise the importance of the health of its employees in general, a dedicated Staff Student Health Services has been operational now for more

than 50 years. It was only in the year 2010 that an institution wide effort was made to look at all the safety aspects for patients and employees. Not surprisingly, several shortfalls were identified and addressed so much so that we were accredited by the National Accreditation Board for Hospitals and healthcare providers (NABH) in December 2013.

It was alongside this that the institution put together an Occupational Health team under the leadership of a trained expert which began to specifically look at the various aspects of occupational health such as musculoskeletal, mental, medical, chemical, dermatological and ophthalmological hazards. It was when we were putting together a policy that the paucity of literature in terms of occupational exposure of eyes to hazardous substances / injuries / infections among healthcare workers especially in India became evident to us.

Eye hazards to healthcare workers include injuries- physical, chemical, blood and body fluids exposure to name a few and also unique to this occupation is the exposure to various infections of the eye. There have been studies among groups of healthcare workers like dentists, who are particularly exposed to hazards, some of which are specific to the healthcare setting. One of these studies among dentists estimated that 29.6% and 51.1 % suffered a hazardous exposure to their eyes by foreign bodies or blood and body fluids respectively(5). These work related hazards are seldom addressed in developing countries like India where most healthcare settings do not have a prepared protocol for immediate attention, treatment in case of exposure and no proper reporting system because of which many eye threatening conditions go unnoticed until late. Needless to mention, even the prevention of these exposures

which can be easily done by using appropriate protective equipment and following hygienic preventive methods, has not been given due importance that it now deserves considering the large workforce directly and indirectly involved in this.

We decided therefore to study the incidence of work related acute exposure of eyes of health care workers at all levels to injuries and infections in addition to documenting modes of injuries, risk factors for the same, availability and use of personal protective equipment where appropriate, absenteeism associated with it, reporting issues and not to mention some of the costs around such morbidity. We hope that this study will be of use especially in India to enhance understanding of the same and help to improve eye safety at healthcare and include a reporting system for the same if not already in place.

2.Aim

To describe the epidemiological distribution of acute work related exposure of eyes of health care workers to hazards in a tertiary healthcare institution.

Objectives

Primary objective

To ascertain the incidence and distribution of workplace related injuries/ hazardous exposures to the eye among healthcare workers in a tertiary healthcare institution

Secondary objectives:

1. To study the risk factors related to workplace related injuries/ hazardous exposures to the eyes among them
2. To assess the severity of these work related eye injuries.
3. To develop an augmented reporting system for reporting occupational eye injuries.

3.Review of literature

Most people spend at least one third of a day at work irrespective of the industry in which they are employed, which can have a strong effect on their health and safety due to work and work-related injuries. The need for provisions to protect worker's health and promote safety at the workplace are therefore said to be very important and has been receiving more attention over the past century all over the world(1)

When industrialization began in the currently developed nations, there were no provisions for the health and safety of workers. Recognising this, both organized and unorganized workers alike continued to struggle for more than a century to obtain safe and healthy working conditions. Occupational Safety and health was however slowly gaining recognition as a key element in the process of social and economic development, with direct and indirect impacts on such areas as the labour market, labour productivity, household income, poverty, social security systems, international trade, and the environment (2)

The continued efforts of particularly the organized labour group of workers began to gain attention towards worker's health and safety in the now developed countries like the United States. Initially state safety laws were passed and then were brought the workmen's compensation laws, but the organized labour continued consistently in their demands for strong preventive legislation to reduce the incidence of occupational diseases and accidents. In this context, the 1970 Occupational Safety and Health (OSH) Act was a major milestone in the effort of working men and women to

enhance the quality of working life by increasing workers' physical, psychological and economic security(2)

India is currently one of the countries in the world with a large working population, most of who belong to the unorganized sector. According to a 2001 census, about 40 million people in India belonged to the working population. As per Director General of Factory Advisory Services & Labour Institutes there were 300,000 registered industrial factories and more than 36,500 hazardous factories employing 2,046,092. Approximately 10 million persons were employed in various factories. The burden of accumulated occupational diseases in India was estimated to be at around 18 million cases.(3)

The Factories Act, 1948, deals with occupational health and safety, as well as welfare of workers employed in a factory. However, more than 90% of the Indian labour force does not work in factories; hence, they fall outside the purview of the Act. Some of these units may be manufacturing, waste handling, using hazardous chemicals or carrying on operations dangerous to the health and safety of workers. The 12th five year (2012-2017) plan document on occupational health and safety recognised the need for a comprehensive OSH initiative including the mining sector, factories, docks and the unorganized sector(4)

In India, the ministry of labour and other state labour departments take up the primary responsibility of OSH. Occupational health and safety in India has not been included in primary health care yet and has to compete with primary & curative health or its budget. While only 1.3% of the GDP is spent on health care, almost

75% of this is spent on curative health. There are around 1125 qualified occupational health professionals in India and only around 100 qualified hygienists as against a requirement of over 8000 qualified occupational health doctors and the requirement only keeps increasing(5)

WHO in its 60th World Health Assembly has also expressed concerns over major gaps between and within countries in the exposure of workers and local communities to work related hazards and their access to occupational health services. International collaboration has been recommended in the following areas including creating awareness on the felt need for occupational health, research to generate data in priority areas, capacity and competence building, technical exchange of experts and fellowships, quality assurance, and accreditation(6)

Occupational health as defined by the World Health organization (WHO) is a multidisciplinary activity aimed at

- the protection and promotion of the health of workers by way of prevention and control of diseases and accidents related to the occupation and by elimination of occupational factors and conditions hazardous to health and safety at work;
- the development and promotion of healthy and safe work, work environments and work organizations;

- enhancing the physical, mental and social well-being of workers and supporting the development and maintaining of their working capacity, as well as professional and social development at work;
- enabling workers to conduct socially and economically productive lives and to contribute positively to sustainable development (2)

Occupational Exposure has been defined as any potential exposure to chemical, radiological, or biological hazard in the workplace with or without the presence of a physical injury (3). **Occupational injuries or illnesses** has been defined by the Occupational Safety and Health Administration (OSHA) as any injury or illness related to work or workplace that resulted in loss of consciousness, days away from work, or restricted work(7) A work related injury or exposure was considered so if an event or exposure in the work environment either caused or contributed to the resulting condition or significantly aggravated a pre-existing injury or illness (5) The degree of work-relatedness of a work-connected disease condition varied in different situations and determined whether a disease was considered an occupational disease, a work-related disease or aggravation of a concurrent disease(8)

Occupational epidemiology is defined as the study of the occurrence of disease in relation to work-related determinants, including those in relation to how, where and when they occurred. Reasonable observations and conclusions are made based on these studies which then aid in initiating interventions that help prevent work related illness and injury(8)

Work environment is defined as "the establishment and other locations where one or more employees are working or are present as a condition of their employment. The work environment does not only include geographical areas or physical locations, but also includes machinery, equipment or materials used by the particular worker in the workplace during the course of his or her work" by the Occupational Safety and Health Administration (OSHA*)* (9)

Occupational health risk versus hazard

Occupational health risk can be described also as the possibility of suffering health impairments from exposure hazards that originate in the workplace environment. The term hazard typically refers to the source of risk in terms of risk assessment in all literature. The likelihood of harming health from exposure distinguishes risk from hazard: a risk is created by a hazard. A toxic chemical for example that is a hazard to human health does not constitute a health risk unless there is an exposure to it.

Work-related accidents and occupational diseases:

In relation to events that affect workers' health, it is possible to distinguish between work-related accidents and occupational diseases.

A work related accident is an event that directly affects a worker's health during the performance of work activities or activities that are directly connected with work such as commuting. They usually refer to physical injuries that have a clear causal

relationship between the acute event and the work activity involved in whereas occupational diseases indicate an underlying pathological process caused by repeatedly performing a work-related activity, which gives rise to prolonged exposure to that hazard. These effects may only manifest after long periods of time. The fact that many of these diseases have a multiplicity of potential sources, including life-style factors, makes it difficult to establish whether or not the condition is directly work related(10)

Health Care Workers: Global and India scenario

In India, of a total population of 1,028,610,328 in 2001, there were 2,069, 540 health workers of which 819,475 (or 39.6%) were doctors, 630,406 (or 30.5%) were nurses and midwives, and 24,403 (or 1.2%) were dentists. Of all doctors, 77.2% were allopathic. Other categories of health workers were pharmacists, ancillary health professionals, and traditional and faith healers, who comprised 28.8% of the total health workforce of total healthcare workers(11)

Healthcare worker refers to all people delivering health care services, including students, trainees, laboratory staff and mortuary attendants, who have direct contact with patients or with a patient's blood or body substances(12)

Epidemiology:

Burden of occupational injuries and illnesses: Global and Indian scenario:

In the year 2005, global data showed an estimated 250 million occupational injuries and 5.4 million deaths due to injuries on an annual basis. Of this, more than 90 percent occurred in low- and middle-income countries where the greatest concentration of world's workforce is found (13) Despite this, only 5 to 10 percent of the workforce in developing countries had some kind of access to occupational health and safety services. In developing countries there have been very few studies that have attempted to identify these factors showing a lack in awareness and the approach and attitude of government policy and healthcare towards studying of factors or determinants that may adversely impact workers of various industries(14)

In developing countries injuries are a common problem faced at the workplace, some being unique to that particular occupation. Issues surrounding them like awareness of preventive strategies, equipment and labour legislation are also important and rightfully gaining interest globally. Much is still to be achieved in this field related to occupational health. (15)

Lack of employment, a global problem and more so in developing nations, may push workers to take up jobs and earn their livelihood working in adverse environments that can put them at undue risk of injury, ill health and even death. Many of these workers are employed in the unorganised sector where they lack any form of social security to cover for illness and injury.(16) As per the economic survey done in 2008, even in India which is undergoing tremendous changes secondary to industrialization, majority (approximately 93 %) of the labour force remains self employed or in the unorganized sector(17)

Most of these issues faced by the workers in various fields need to be adequately addressed systematically and using multi pronged strategies involving many fields of expertise(16)

One of the safety mechanisms developed over the years especially in industrialized countries and which has produced favourable results with regards to worker safety and health is the access to occupational health and safety through a group of professionals – the occupational health team. The team includes occupational health physician, qualified nurse, physiotherapists and ergonomists/ hygienists apart from other support staff. They begin with an assessment of risks in each workplace, followed by more specific services such as exposure monitoring and specific health examinations(13)

The importance of establishing effective occupational health services (OHSs) for small- and medium-scale enterprises has long been stressed. One study compared occupational safety mechanisms implemented in Japan and Finland and showed that in small and medium scale industries there were organized groups of professionals who functioned as a team who were required to visit the worksite at least once per month to assess risk, and to attend occupational health and safety committee meetings to discuss related issues.

The function of the occupational health team was different between the two countries. In developed, industrialized countries such as Finland, the occupational health team first visited client enterprises and assessed occupational risks with the employer and employees' delegates to study the type of services that were included as part of good occupational health practice. Preventive service, officially stipulated as Good Occupational Health Services, was promoted by providing 50 percent reimbursement

of the cost towards measures taken which was not found in Japan. Finland was found to have attained comparatively higher coverage of OHS than Japan, not only through legislation but also by using flexible OHS models. In Finland the content of the services was determined according to a risk assessment of each workplace and emphasis was placed on prevention, whereas in Japan health management based on a general health examination was the major type of Occupational Health Services (13) This is in contrast to a country like India, where this kind of an OHS structure or mechanism of ensuring safety of workers in a particular work environment is not built into the system and has not been accorded the importance that it rightly deserves. It is with this background that it can be safely emphasized that this gap in healthcare services both preventive and curative needs to be particularly addressed in India.

Occupational safety and health (OSH) has been receiving more attention both in India and globally. OSH is now increasingly recognized by Latin American, Caribbean governments and international organizations as an important part of public health(10) Guidelines formulated by The International Labour Organization (ILO) has encouraged the integration of OSH with other management systems stating the importance of it as an integral part of business management(16) which gives it the much needed attention that it deserves. However it will depend on how it is adopted by different countries and factors like political will which can have a major implication on how well these initiatives are implemented and will translate into a more healthy and empowered workforce both in the organized and un organized sectors.

There seems to be a global consensus building up on the fact that there are lacunae that need to be addressed with respect to workers health in all industries including healthcare industry. Healthcare is one of the industries that is showing high growth rate in developing countries, employs a significant percentage of the workforce but lacks in the very area of comprehensive safety and health service. Therefore and it is time that this lack is addressed with an emphasis on the preventive aspect.

Various factors affecting occupational health

There are very few studies pertaining to occupational eye injuries and hence lessons are being drawn here from all injuries wherever there are none in relation to work related eye injuries.

Age group

In an Indian study that was done among those who presented to a hospital in Bangalore with ocular trauma which occurred at the workplace it was seen that 72.2% of ocular trauma occurred in the age category of 21-40 years and 230 (75%) cases were men versus 76 (25%) were women(18). An Ethiopian study showed that workers in the age group below 30 years old were about 1.9 times more likely to report occupational injury than workers whose age group was 30 years and above (AOR 1.90, 95% CI 1.22, 2.94)(15)

Gender distribution

Literature from across the world, done in both developed and developing countries reported that men had a higher risk of occupational injury than women (15)

According to the findings of a study done in Ethiopia, male workers were about 2.5 times more likely to report occupational injury than female workers . This was explained as due to high willingness of male workers and tendency to engage in risk-taking behaviour than female workers who tend to avoid risk taking at the workplace (15) Similar findings have been reported from studies elsewhere in the world too. A study among workers in France showed that men had higher risk than the women (AOR 1.99, 95% CI 1.43-2.78)(20)

According to WHO region wise statistics, the proportion of female doctors in Europe had increased steadily during the 1990s, as did the proportion of female students in medical schools. In the United Kingdom, women now constitute up to 70% of medical school intakes. Studies on the health workforce in India showed that of all health workers 38.0% were female. The ratio of all heath workers as male:female was 1.6,. The ratio was 5.1 for doctors, and of nurses and midwives 0.2. (11)Another reason for there being a high number of females in the healthcare professions is the higher number of females in the nursing profession.

Education and injury

Better educational level has been associated with better outcomes in relation to many health indicators and is true as seen in most occupational health and safety studies conducted in developing countries. An increased educational level had been associated with decreased work-related injuries (20) (21) A significant association was also found between higher education (higher than secondary level) in that study done

among health care workers in Nigeria(22) This is due to the fact that education is more likely to increase workers safety and health practice that can prevent them from occupational injuries(15,23). The Maastricht cohort Study done on risk factors for occupational injury found that subjects in the lowest educational group had approximately a sevenfold increased risk for being injured in an occupational accident compared to the group with the highest educational level (RR 7.38, 95% CI: 3.64 to 14.98). The subgroup with a medium educational level had approximately a fivefold risk for being injured in an occupational accident compared to the study subjects with the highest educational level (RR 5.79,95% CI: 2.83 to 11.87)(24)

Training and injury

Training on health and safety related issues was found to be associated with reduced work accident rates among industrial workers. This is due to the fact that training for health and safety could both motivate workers to be safer and instruct them to practise correct and safe behaviours. A case control study done in Ethiopia, aimed at identifying various factors contributing to injury among industrial workers showed that lack of training, made workers to be at a higher risk. (AOR 1.85, 95% CI (1.17, 2.91).Therefore the study had also recommended that providing basic health and safety training with special emphasis on younger and male workers were needed to address the issues (15) This being a common factor with the healthcare industry as well, it can be confidently said that training has to be an important measure in ensuring safety even among the healthcare workers.

Temporary versus permanent workers

An occupational injury study was conducted in eastern India as part of surveillance for five years duration in 2004 among the workers of a fertilizer producing industry. Risk of injury was higher in temporary workers in comparison to the permanent time rated workers. Accident incidence rate, accident frequency rate and accident severity rate were found to be significantly higher in temporary workers(25). With regards to the years of experience, a study done in Nigeria among healthcare workers showed that respondents with experience of 10 years and above (88.9%) reported higher levels of awareness of universal precautions compared with those less than 5 years experience (51%)(26). Temporary worker status and lesser years of work experience were seen to be factors affecting work associated injury.

Common types and sites of work related injury

Site of injury varies with the nature of work and the work environment and has been studied in many parts of the world. Abrasions, cuts, burns, puncture, and fracture were the common injury types among workers(15)

Work related hazards and injuries to the eye at the workplace were commoner than previously thought. According to US bureau of Labour statistics in 2008, there were 27,450 nonfatal occupational injuries or illnesses involving the eye (or eyes) that resulted in days away from work(27). The typical eye injury resulted from the eye being rubbed or abraded by foreign matter such as metal chips, dirt particles, splinters, or by these types of items striking the eye. These injury events resulted commonly in

surface wounds, such as abrasions, scratches, and embedded foreign bodies (splinters and chips). Potential eye hazards are usually common to and found in nearly every industry (27)

Stress and injury

The interesting relationship between stress and work related mishaps was understood and proved to be true based on studies done which had found that workers who were stressed highly due to their job were more likely to report more than 2.5 times occupational injury compared with their counterparts who were not stressed out (9). This was also mentioned as a risk factor in the aforementioned study done in Ethiopia especially sleep disturbance, and job stress as they were found to go together(15)

Exposure time and higher hazard

Occupational risk could be determined both by the level and the duration of exposure to hazards. Workers in developing countries tend to work longer in the presence of occupational hazards than those in more developed countries. For example, it is common for employees in many Latin American and Caribbean countries to work 50 or more hours per week. Thus, even when work is done in environments that are considered safe by standards established in industrialized countries, where the typical exposure is a 40-hour work week, the longer work week may result in exposure levels that exceed safety levels(10). The Maastricht cohort study on risk factors for occupational injury showed that shift workers with night shifts had almost a threefold

risk for being injured in an occupational accident compared to daytime employees (RR2.74, 95% CI: 1.84 to 4.09)(24)

Occupational hazards and injuries among healthcare workers

Global and Indian scenario

Health care workers face a wide range of hazards on the job, including sharps injuries, hazardous exposures to chemicals and drugs, violence, back injuries, latex allergy and stressors. Although it is possible to prevent or reduce healthcare worker exposure to these hazards, healthcare workers continue to experience injuries and illnesses in the workplace. Cases of nonfatal occupational injury and illness with healthcare workers are among the highest reported from any industry sector(28)

Because of the physical nature of many hospital jobs, private industry hospital employees face a higher incidence of injury and illness, nearly 6.0 cases per 100 full-time workers (US data, 2011). This was surprisingly twice the number as compared to other industries traditionally considered as dangerous to employees, such as manufacturing and construction(29) There obviously are particularly unique risks to healthcare workers that are uncommon in other industries. In particular- workers may exposed to potentially contagious patients and sharp instruments with blood or body fluid contamination and that contain harmful organisms(30)

Even though in developed or high income countries such as the United States and France where more than 90 percent of hospitals have systems in place or programs set

up to manage employee safety and health, it takes effective implementation and commitment to protect workers and reduce injuries and illnesses. In the absence of this, the program or initiative remains only on paper which is nevertheless an important first step towards reaching the goal of implementation. Statistics in these countries show that hospitals are still relatively hazardous workplaces, and they have much room to improve(30)

Though there is literature from studies in developed countries, the fact that in developing countries there is a lack of research in this field shows that there is a need to look closely at employee health and welfare.

Injuries/ hazardous exposures to the eye at the workplace

According to the U.S. Bureau of Labour Statistics, 2016, more than 20,000 workplace eye injuries happened each year. Injuries on the job often required one or more missed work days for recovery. In fact, the Occupational Safety and Health Administration (OSHA) reports that injuries in workplace cost an estimated $300 million(31) In a cross-sectional study conducted among 209 welders in metal industries of Puducherry, while all of them had some injury, more than 75% of them had lacerations and foreign body in the eye(32)

Among healthcare workers:

Blood and body fluids exposure in healthcare workers

Healthcare workers (HCWs) are exposed to droplets or splashes of blood, saliva, urine and other body fluids regularly. Percutaneous injuries and splashes of these fluids

have been found to be sources of exposure to blood-borne organism that are pathogenic such as human immunodeficiency virus (HIV) hepatitis B virus (HBV), hepatitis C virus (HCV), and were responsible for Healthcare workers (HCWs) developing a significant proportion of HBV, HCV, and HIV infections over the years(18,33)

To show the high incidence of such exposures, a laboratory-based experiment done by Cambridge care, in which 105 venipunctures were performed in a simulated brachial vein containing mock venous blood showed that the retraction mechanism which was activated in a testing chamber with precut fabric filters, placed at 3 different locations, to capture blood splatter detected blood splatter visually and microscopically. The findings demonstrated that splatter, which can potentially expose healthcare workers (HCWs) to bloodborne pathogens, is associated with the activation of intravascular catheters with retraction mechanisms. Healthcare workers (HCWs) may not detect this splatter when it occurs and may not report a splash to mucous membranes or non intact skin. Therefore the study while expressing the fact that many of these exposures go unnoticed to the Healthcare workers (HCWs) also concluded that they needed to wear personal protective equipment when using such devices(34)

Exposure classification of an occupational exposure to blood and body fluids

Exposure Classification	**Risk Factors**	**Follow up**
Massive Exposure	Transfusion of blood injection of large volume of blood/body	Immediately identify the source individual (if known)

	fluid (>1mL) □ parenteral exposure to laboratory specimens containing high titre of virus	□as a minimum undertake baseline screening of the exposed person
Definite Exposure	□ skin penetrating injury with a needle contaminated with blood or body fluid □ injection of blood/body fluid not included under 'Massive Exposure' □ laceration or similar wound which causes bleeding and is produced by an instrument that is visibly contaminated with blood or body fluid □ in laboratory settings, any direct inoculation with HIV tissue or material or material likely to contain HIV, HBV or HCV not included below	□ provide follow up
Possible Exposure	□ intradermal ('superficial') injury with a needle contaminated with blood or body fluid □ a wound produced with an instrument contaminated with blood or body fluid not associated with visible bleeding □ prior (not fresh) wound or skin lesion contaminated with blood or body fluid ☑ **mucous membrane or conjunctival**	

	contact with blood □ human bite with blood exposure or scratch	
Doubtful Exposure	□ intradermal (‘superficial’) injury with a needle contaminated with blood or body fluid □ a wound produced with an instrument contaminated with blood or body fluid not associated with visible bleeding □ prior (not fresh) wound or skin lesion contaminated with blood or body fluid ☑ **mucous membrane or conjunctival contact with blood** □ human bite with blood exposure or scratch	□ conduct baseline screening of the exposed person □ documentation by the way of incident reporting and the possibility of further counselling may still be required □Follow up at 3 months may be indicated based on risk assessment.
Non-exposure	□ intact skin visibly contaminated with blood or body fluid □ needlestick with non-contaminated (clean) needle or sharp	□ no further follow-up, although documentation by the way of incident reporting and the possibility of further counselling may still be required

The above table (35) shows a practically useful classification of blood and body fluids exposures. It is evident from the above classification that BBF splashes to the face / eyes come under 'Possible and/or doubtful exposure'.

Chemical injuries to the eye in healthcare workers:

Various chemicals have become a part of everyday life, and are important to many of our activities. Though they are very useful, the rapid growth of chemicals at workplaces has brought new dangers to workers including healthcare and others exposed to it in the general public and the environment. With modern technology making rapid strides it becomes necessary to design correct operating procedures, not only for workplaces but also for all people dealing with hazardous substances. These people need to be educated and trained to identify hazards presented by chemicals and to plan, prevent and monitor these hazardous situations(16)

Ocular chemical injuries are emergencies in ophthalmology and may require intensive, immediate evaluation and treatment. Sequelae in ocular burns are often severe and particularly challenging to manage. Improvements in the understanding of the pathophysiology of chemical injuries, as well as advancements in ocular surface reconstruction have provided hope for patients who would otherwise have a dismal visual prognosis. After chemical injury, the goal of therapy is to restore a normal ocular surface and corneal clarity. When corneal scarring is extensive, limbal stem cell grafting, amniotic membrane transplantation and possibly keratoprosthesis can be employed to help restore vision.(36)

There is now literature available which discuss newer techniques available to improve the prognosis of patients with chemical injuries(37). **S**plashes from acids or alkali chemicals are serious and may cause vision loss and may need urgent medical attention (38)

Acid burns

Acids have lower than normal pH values of the human eye (7.4) they precipitate tissue protein, creating a barrier to further ocular penetration. Due to this fact acid injuries tend to be less severe than alkali injuries. One exception to this is hydrofluoric acid, which may rapidly pass through cell membranes and enter anterior chamber of the eye and decrease in levels of aqueous ascorbate has been demonstrated(37)

Alkali burns

Alkalis deposit within the tissues of the ocular surface causing saponification reaction within those cells. The damaged tissues secrete proteolytic enzymes as part of an inflammatory response which leads to further damage. (37)

Classification of chemical injuries

Classification schemes regarding the extent of the initial injury were initially developed in the mid 1960's first by Ballen and then modified by Roper-Hall. The Roper-Hall classification system was largely based on the degree of corneal haze and the amount of perilimbal blanching/ischemia(37)

Grade	Prognosis	Cornea	Conjunctival limbus
I	Good	Corneal epithelial damage	No limbal ischemia
II	Good	Corneal haze, iris details visible	<1/3 limbal ischemia
III	Guarded	Total epithelial loss, stromal haze, iris details obscured	1/3-1/2 limbal ischemia
IV	Poor	Cornea opaque, iris and pupil details obscured	>1/2 limbal ischemia

Pfister subsequently made a classification system varying from mild, mild-moderate, moderate severe, severe and very severe based upon pictures and photographs demonstrating corneal haze and perilimbal ischemia(39)

The major treatment goals that are important throughout the healing phases are:

(a) Re-establishment and maintenance of an intact and healthy corneal epithelium

(b) control of the balance between collagen synthesis and collagenolysis and

(c) minimizing the adverse sequelae that often follow a chemical injury(37)

Formaldehyde is a colourless, flammable gas, extremely soluble in water and is used as formalin in healthcare settings. A study done among workers to assess exposure to formaldehyde showed that anatomists, technicians embalming bodies and even medical students during their dissection course are also exposed. Irritation of the eyes has been documented at as low a concentration as 0.24 ppm.(40)

Foreign body/ projectile associated trauma in healthcare workers

Dental technicians, doctors during dental laboratory procedures have increased chances of serious eye injury. This would include traumatic injuries due to projectiles or through exposure to harsh chemicals or heat and infections from contact with patient body fluids(41)

A similar study done among dentists in Nigeria showed that those older than 30 years constituted 69 (46.6%) of the respondents. There were totally 148 respondents of which 56 (37.8%) reported foreign body, 18 (12.2%) splash, 33 (22.3%) both foreign body and splash and 41 (27.7%) reported no ocular event. The overall prevalence of ocular splashes and foreign body among the respondents was 107 (72.3%). There was significant association with age and years of practice. The pattern of safety eye goggle wear among the respondents were never 32 (21.6%), rarely 37 (25.0), occasionally 29 (19.6%), sometimes 39 (26.4%) and always 11 (7.4%). The prevalence of ocular events was significantly associated pattern of safety eye goggle wear(42)

Eye Infections as an occupational hazard among healthcare workers

In the health care setting, blood-borne pathogen transmission occurs mostly by percutaneous route or mucosal exposure of workers to the blood or body fluids of infected patients. Occupational exposures that may result in transmission of such pathogens which include direct inoculation of pathogen cutaneous scratches, skin lesions, abrasions, or burns, as well as inoculation of the organism onto mucosal surfaces of the eyes, nose, or mouth through accidental splashes(22)

Conjunctivitis found in health care workers may be bacterial, viral, chlamydial, fungal or acanthamoebic, and these infections account for a large proportion of the workload in ophthalmic centres. Cross-infection may occur through contaminated instruments, hands, common towels and droplets. Patients with dry eye or inadequate lid closure are more susceptible to developing infections of the eye(43)

Personal Protective Equipment (PPE) and factors affecting its usage

The US Bureau of Labor Statistics, according to a survey of workers who suffered eye injuries found that nearly three out of five were not wearing eye protection at the time of the accident. (28) Various studies have reported the adverse effects of eye injuries owing to lack of utilization of eye protection. In a study conducted by Ramos MF, eye injuries accounted for 6% of all national injuries with 60% of those injured professing to not having worn any eye protection. (44) The adverse effects that could ensue include corneal abrasion, hemorrhage, conjunctivitis, keratitis (bacterial or viral), hepatitis, and human immunodeficiency virus (HIV)(45)

A prospective study involving 25 healthcare personnel in an orthopaedic operating room showed that the visors worn by the operating team were examined postoperatively to identify any visible blood, fat and body tissue splashes showed that the visor is a reliable barrier and minimises the risk of exposure to blood-borne viruses. The study concluded that a visor should be worn during all joint arthroplasty procedures and any procedure that involved the use of power tools.(46)

American dental association (ADA) and Occupational Safety and Health Administration (OSHA) have outlined that dental staff who are a vulnerable group for eye injuries should wear either a face shield or shatter resistant glasses with side shields while performing the procedures that could result in projectiles, chemicals, and aerosols entering the eye. The presence of an eye wash station within 7.62 meters of all the employees has also been emphasized so that immediate care can be given (47)The first 10 to 15 seconds after exposure to a hazardous substance, especially a corrosive substance, was found to be critical. Delaying treatment, even for a few seconds, has been found to cause serious injury.(48) Hence, protection of the eyes was considered an integral part of any procedure.

Bhatsange et al in a study done in India among dentist concluded by stating that though accidents do occur, their frequency could be minimized by the implementation of certain set standard guidelines. Visual health needs to be considered as a vital component of general health. Specific guidelines for eye protection that have been recommended and updated by OSHA, ADA, and BDA need to be implemented failing which serious outcomes could be expected. These injuries can be prevented with the use of common sense, proper education, adequate eye protective eyewear, and correct handling of instruments and materials(45)

In a multicentre cross sectional study in south western Saudi Arabia done among dentists, approximately 4.2% and 9.2% of dental practitioners reported incidents of ocular injury and infection, respectively, and 14% reported never to have worn eye protection. Two hundred and thirty three dental practitioners were examined of which 29.6% and 51.1% reported ocular incidents as a result of foreign bodies and fluid

splashing, respectively. The other factors found to be associated with poor compliance of wearing eye protection were the absence of postgraduate qualification, and working long hours (49) Awareness regarding wearing personal eye protection and compliance is paramount in prevention of hazardous exposure of the eye to injury and infections at the workplace and in the healthcare workplace in particular.

In one study done among dermatologists it was shown that contamination from blood splashes during dermatologic procedures (Moh's micrographic surgery, excision, repair) occurred in 66.4%. Reconstruction type, anticoagulation use, wound location, and wound size correlated with a higher blood splash rate. This study showed that face shields and goggles are used inconsistently(50)

Two Indian studies have reported practice of barrier precautions by only 57% of healthcare personnel(51,52) and doctors reported higher rates of compliance compared to nurses in one study(53) The reasons given by those who did not use personal protective devices (PPDs) included difficulty/inconvenience at work caused by PPE use (71%), non availability (64%), and lack of time or emergency nature of work (37%). Only about half of the healthcare personnel opined that adequate equipment and supplies were provided to implement universal precautions in one Indian study.(5) A cross sectional study done among hospital attendants whose nature of work comes with different hazards and risks (their job includes help by supporting patients' personal hygiene and daily living needs), stated that work related hazards could be avoidable provided by practices such as appropriate use of personal protective equipment, however, many of these cadre of hospital workers have poor basic knowledge of infection control(22)

Prevention of workplace injuries/exposures (WHO)

Education

The aim of safety education is to do work in a safe way until it becomes a habit.

Audiovisual aids, e.g. lectures, posters, films, videos, slides, radio and television programmes, are very important in safety education.

A study done in Nigeria among healthcare workers showed that among those who were aware of standard precaution, 48 (55.2%) had information about it from seminars and workshops, 24 (27.6%) from classroom lectures and only 15 (17.2%) from books and health programmes on television and radio(26)

Training

A training programme is needed for new employees when new equipment or processes are introduced, when procedures have been revised or updated, when new information must be made available and when performance of employees needs to be improved.

Retraining is indicated when there is a high accident or injury rate or high labour turnover(8)

Sickness Absenteeism

Severe injuries can lead to workers missing work or being assigned to restricted or modified duty. Collectively, the rate of such injuries in some literature has been referred to as the Days Away, Restricted, or Transferred (DART) rate(30) The rate of eye injury and lost work time could each be reduced by 50% or more when personal

protective eyewear was worn, according to a review of the effectiveness of various interventions for preventing work-related eye injuries in the American Journal of Preventive Medicine(54) Studies from the Indian context along similar lines are scanty and are therefore necessary to assess and define the magnitude of the burden and risk factors.

Reporting systems in healthcare institutions

Self-reporting is one of the most widely used methods to collect information regarding individuals' health status and utilization of healthcare services. According to a systematic review of 42 studies evaluating the accuracy of self-report utilization data, (where utilization was defined as a visiting a health provider) showed that self-report data are of variable accuracy. Factors affecting accuracy included sample population, recall time frame, type of utilization, utilization frequency, questionnaire design, mode of data collection, cognitive abilities and use of memory aids and probes.(44) Another study from a premier tertiary healthcare institution in South India reported blood borne virus exposures and suggested that the reporting system to self report such injuries be simple and hassle free and that awareness regarding availability and effectiveness of post exposure prophylaxis need to raised in order to improve reporting.

Occupational exposures are common in the developing world and it is believed that 40–75% of these injuries are not reported. Needle stick and sharp injuries which go upreported are a serious problem and stop injured Healthcare workers (HCWs) from receiving post exposure prophylaxis (PEP) against HIV, which is shown to be 80%

effective in preventing HIV infection in these subjects. Similar numbers for muco-cutaneous injuries were not known in literature. Though blood borne pathogens are a serious area of concern there is very limited available comprehensive data from research in India on this aspect(18) Retrospective reporting as seen in a similar study was limited in its value due to the recall bias that cannot be fully avoided(55)

Health care-seeking behaviour

Health or help-seeking behaviour is used interchangeably in the literature. This complex concept, described by Cornally et al. can also be termed 'help-seeking behavior' and defined as "a problem focused, planned behaviour, involving interpersonal interaction with a selected health-care professional" when seeking help for a health problem(56)

Gender differences in ultilization of healthcare

Bertakis KD et al. in their study 'Gender Differences in the Utilization of Health Care Services' published in the year 2000 found that among 509 patients who were randomly assigned to primary care physicians at a university medical center, their use of health care services over a period of 1 year showed that after controlling for health status, socio-demographic information, and primary care physician specialty in the statistical analyses, women had a significantly higher mean number of visits to their primary care clinic and diagnostic services than men. (57)

Under reporting among healthcare workers

A study by Gershon et. al. where different types of healthcare workers were surveyed found that about 29 % of respondents had some sort of exposure incident in the previous 6 months, and, only about 44 percent of them were reported(45)

An estimate of more than 8 million health care workers (HCWs) in the United States may be exposed to blood and body fluids. In a study done among 505 HCWs, the target sample population including all the medical students; nursing professionals; dental professionals; and residents in internal medicine, emergency medicine, surgery, and obstetrics and gynecology at the University of Illinois Medical Center, Chicago, Illinois, a metropolitan tertiary care and referral center for Northern Illinois and Northwest Indiana findings showed that the most common year of exposure was the intern year. The most common reason for not reporting was the belief that the exposure was not significant, followed by the combination of believing the exposure was not significant and being too busy. The study concluded that underreporting of blood and body fluid exposures was common because of a belief that most exposures were not significant. More education of HCWs was needed to change this perspective(58).

Cost of health care

Attempts to estimate the direct and indirect costs of work place related injuries and infections are few. Occupational Safety and Health Administration (OSHA) reports that workplace eye injuries cost an estimated $300 million a year in lost productivity, medical treatment and worker compensation(31)

The variety of occupational eye hazards and risk factors unique to this field of healthcare as discussed in the literature available elsewhere may be useful to design similar studies in India to determine the burden of the problem and also to identify risk factors that will help in moving towards the goal of ensuring Occupational Health and safety in the field of healthcare.

4.Materials and methods

4.1 Study Setting

The study was done as a hospital based prospective observational study in a tertiary care healthcare institution in South India.

a. **Ethical clearance**: Was obtained from the Institutional review board (IRB) before the commencement of the study.
b. **Participants**: Any staff or student (on CMCH payroll or student- during the time period between February 15th, 2017 to August 14th, 2017) who while at the workplace doing his/her job, had an acute work related injury/ hazardous exposures to the eye, fulfilling the inclusion criteria was eligible to be recruited. All the staff and students of the institution excluding peripheral centres were eligible to be participants in the study.
c. **Procedures prior to start of study**: Permissions were obtained from Medical superintendent of CMCH, Principal Christian Medical College, Dean: College of Nursing, Nursing superintendent and General Superintendent who are the appointing authorities for all staff and students. Posters were made and displayed all over the hospital and college. Broadcasting was also done through intranet services. Letters were sent to all the departmental HODs/ HOUs. Occupational health team was also informed of the study.
d. **Questionnaire**: A structured questionnaire included the details of their status(staff or student), contact information, demography, study and work experience, department, ocular and systemic co morbidities, spectacle wear in

addition to the details of the current incident, use of personal protective equipment, sick leave and findings of comprehensive eye examination with treatment details. It was first pilot tested before commencement of the study.

e. Reporting:

During working hours:

The participant was asked to inform the Principal investigator or Staff Students Health Services (SSHS) duty doctor and present him/herself to the Staff Students Health Services (SSHS) OPD / Schell eye hospital (Ophthalmology department) General/Private OPD, Ophthalmology department emergency or to the Accident and Emergency medical officer.

After working hours:

He or she had to inform the Principal investigator or Staff students health services (SSHS) duty doctor and present to either the duty doctor to Schell eye hospital (Ophthalmology department) emergency/ the Staff Students Health Services (SSHS) duty doctor or to the Chief medical officer (CMO) of Accident and Emergency department.

f. Procedures at first point of contact:

Patient was registered at the point of first contact, first aid was given depending upon the type of eye hazard. The participants who presented with a Chemical splash or Blood or Body fluid splash (BBF) or a combination of both Chemical and BBF splash were given thorough eye irrigation with Normal Saline or Ringer Lactate or Balanced

Salt Solution with assessment of pH prior and subsequent to the eye wash. The participants who had blood and body fluid splash were investigated for blood borne viruses through a blood test. Those participants who presented with blunt or sharp ocular trauma or foreign bodies were given an eye shield and advised not to rub the eye and those who presented with eye infection were advised on hand hygiene and fomite care.

g. Procedures with the Principal Investigator (PI) or duty doctor at Schell eye hospital emergency:

a. Information sheet regarding the study (Annexure 3) was given and Informed Consent (Annexure 4) was obtained by the PI, before the questionnaire was administered.
b. Questionnaire was administered (Annexure 2)
c. Comprehensive eye examination either at the first point of contact or at the Schell (ophthalmology department) hospital was done. It included the assessment of best corrected visual acuity by using Snellen's chart, pupillary reaction evaluation by torch light, examination of the anterior segment of the eye by using a regular slit lamp or a hand held slit lamp, intraocular pressure was checked by Goldmann applanation tonometer or Tonopen and posterior segment examination was either by indirect ophthalmoscope using 90D/20D lens or by direct ophthalmoscope.

In case of chemical injury or splash, the extent of injury was assessed by slit lamp and also with cobalt blue light after staining with flouroescein and classified based on the

severity of injury using standard classification system, the Roper Hall's classification. Depending on the severity they were treated with Topical antibiotic eye ointment namely ciprofloxacin, artificial tears, topical steroid eye drops like Flourometholone or Prednisolone for one week to ten days and cycloplegic agents namely cyclopentolate eye drops.

In case of trauma and foreign body, severity of the injury and the structures involving the eye were examined in detail and classified based on ocular trauma score. They were treated depending on the type and severity of injury. Corneal and conjunctival foreign bodies were removed under topical anaesthesia either with cotton bud or 26 gauge needle and the superficial foreign bodies in the fornices were given eye irrigation. The eye was re examined by fluoroescein stain under cobalt blue light for any epithelial defects following the removal of foreign body. They were treated with antibiotic eye drops and artificial tears.

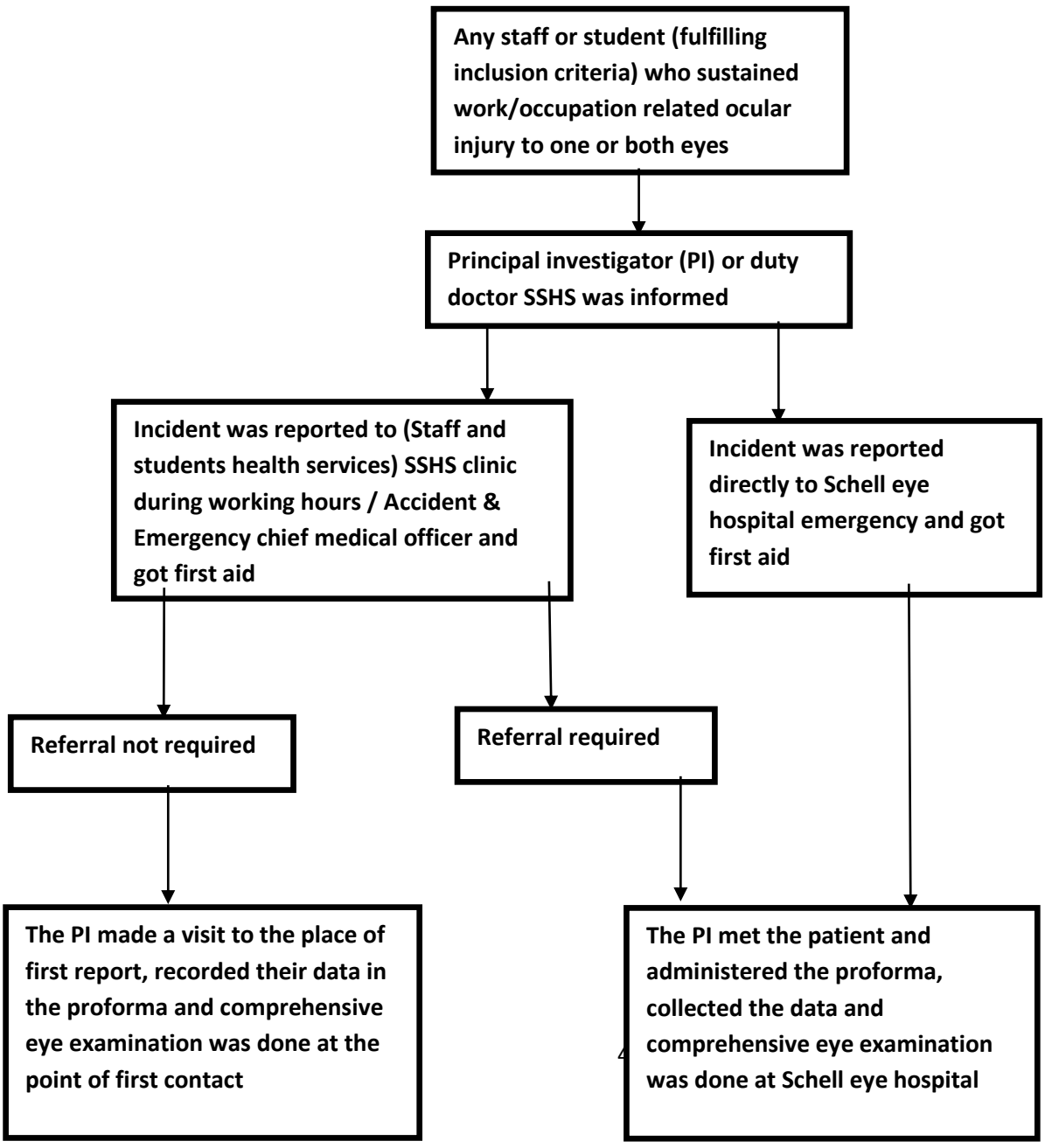
In participants who presented with infectious conjunctivitis, the eye lids, bulbar and palpebral conjunctiva and cornea were examined and assessment of preauricular / submandibular/submental lymphnode enlargement was also done. It was then classified into bacterial, viral and allergic conjunctivitis. Lid hygiene, hand hygiene, fomite care were taught. They were treated with topical antibiotic eye drops namely Chloramphenicol and lubricants namely Carboxymethyl cellulose in bacterial cases, topical antibiotic eye ointment namely ciprofloxacin and topical steroid eye drops namely Flourometholone in viral conjunctivitis and topical antihistaminic eye drops namely Olopatidine for allergic conjunctivitis.

h. **Procedures for follow up**

The participant was asked to follow up in the eye hospital OPD once within a week and frequently if needed depending upon the type and severity of injury.

Participants who developed nummular keratitis in subsequent visits were treated with combined topical steroids and antibiotic drops namely Chloramphenicol and Dexamethasone or topical steroids namely Flourometholone.

Detailed diagrammatic Algorithm of the study



4.2 Study Design-

The study was as an observational study. The participants came in contact with the interviewer, once initially at recruitment during the time of incident and then if they had come for follow up, during the study period. Data collection after enrolling participants was done during the period from February 15th 2017 to August 14th 2017.

4.3 Study population

4.3.1 Definitions:

a. **Work related exposure** for the purpose of our study was defined as an acute exposure to blood and body fluids, chemicals, injury with either blunt or sharp objects, a foreign body or conjunctivitis.
b. **Health Care Worker** in our study was defined as a staff or student who was working either in clinical or in para clinical areas. The para clinical participants included those working in office areas, library, cash counter and other supporting staff.
c. **Work environment** in our study was defined as primarily composed of: (1) The employer's premises, and (2) other locations where employees were engaged in **work**-related activities or were present as a condition of their employment. This did not include institutional recreational facilities.

4.3.2 Inclusion criteria:

All health care workers (staff including confirmed, non confirmed and project in the tertiary care hospital and students) currently enrolled in our institution were eligible to participate. Those who presented with acute workplace related injuries/ hazardous exposures from February 15th 2017 to August 14th 2017 were included in this prospective study.

4.3.3 Exclusion criteria:

Staffs of peripheral hospitals i.e from CHAD, RUHSA and LCECU and other peripheral units were excluded.

4.4 Sample size

All staff and students were eligible to report acute occupational injury to the eye and those who reported the incident and all those who presented to the departments of Ophthalmology/ Staff Student Health Services/ Accident and emergency or to the duty doctor or casualty medical officer with eye injuries or exposure were taken into the study during the time period between February 15th 2017 to August 14th 2017.

There has been no report available in literature to calculate the sample size.

An estimate of the probable number of cases of blood and body fluid exposure alone that could be included in this study was done using the SSHS register and found to be approximately 30 cases to the face and eye in 1 year of the 317 cases who presented with all blood and body fluid related injuries to the SSHS. It was determined to

include all cases that presented with either BBF exposure and all those who presented with chemical exposure, blunt or sharp injuries and foreign bodies in the eye. All cases of infective conjunctivitis among staff and students were included in the study, as the objective was to determine incidence in a tertiary care institution.

4.5 Sampling Method

All the staff and students reporting to Ophthalmology (Schell) department emergency room, Ophthalmology (Schell) OPD, Staff and students health services (SSHS) and Adult accident and emergency departments were included in the study. A line list was prepared of those presenting to the first point of contact but not reporting to the study, they were then contacted and included after obtaining the required consent. The Ophthalmology emergency room register was checked periodically to ascertain if any cases were not reported or overlooked and were included after taking the consent, administering the questionnaire and retrieving clinical data and findings at the time of first presentation from the patient's hospital records.

4.6 Study tools

The study tools included Posters (Annexure 1), Information sheet (Annexure 3),Consent form (Annexure 4), structured questionnaire (Annexure 2),grading of hazards by The Roper Hall classification of chemical injuries, Ocular trauma score ,Exposure classification of occupational exposure to Blood and body fluid, Snellen's

visual acuity chart, Measuring tape, Torch to assess relative afferent papillary defect, Slit lamp – standard or hand held (Heine), Lignocaine and carboxy methyl cellulose eye drops, Fluorescent strips, Applanation prism or Tonopen(Reichert) to measure intraocular pressure, Dilating eye drops(Combination of Tropicamide 0.5% and Phenylephrine), 90D lens, indirect ophthalmoscope with 20 D lens , direct ophthalmoscope (Heine beta 200).

4.7 Data entry

Data entry was done using Epidata v7.0 software.

4.8 Analysis

Data analysis was done using SPSS v20.0 software with the help of a statistician. Descriptive statistics was reported using Mean±SD for continuous variables, Median (Inter Quartile Range) was reported wherever appropriate. Categorical variables were reported using Frequency and percentage. The Incidence of the occupation related injury to the eye in Christian Medical College Vellore was reported using the frequency, percentage along with the 95% CI. Association of the risk factors with the Demographic variables was carried out using Chi-square / Fischer test for categorical variables. Continuous variables which are normally distributed were assessed using Two Independent sample t test after checking for normality. For comparing incidences between groups with respect to age, gender and category of workers we

used two proportions test. Regression analysis to study the risk factors for the occupational hazard related to eye was done using Binary Logistic Regression. Probability P value <0.05 was considered statistically significant in our analysis.

1. Slit lamp examination of a participant

2. Dental procedure in progress

3. Saline irrigation of the eye

4. Eye wash station

5. Results

Our study was conducted on staff and students of Christian Medical College and hospital, Vellore from February 15th, 2017 to August 14th, 2017.

5. A. Distribution of health care workers in CMCH:

The total strength of staff employed in CMCH during this period was 9367, which included 6614 confirmed and 2753 unconfirmed staff.

There were a total of 6083females and 3284 males. There were 3307 aged 30 years or less and 6060 more than 30 years of age.

There were 2053 students on rolls in the various undergraduate programs including MBBS, Nursing, Allied health sciences.

5. B. Incidence of Acute exposure of eyes of health care workers to hazards:

During the study period, 94 of the total of 11,420 staff and students reported through one of the points of first contact, making the incidence of hazardous exposure / infections to the eye from the tertiary care hospital to be 0.8 % (8 per 1000). The 95% confidence Interval [CI] was (0.64%- 0.96%)

The incidence for staff (82 / 9367) was 0.87%, (8.7 per 1000) and that of students (12/2053) was 0.58% (5.8 per 1000)

There was no significant difference between the proportion of staff and students reporting with exposure to hazard / infection. (95% CI from -0.14% to 0.72%).

5. C. Demographic distribution of health care workers who reported to the study:

The distribution of healthcare workers who reported to the study was as follows

Table 1a. Demographic Characteristics of HCW in our study:

Demographic variable		**Frequency**	**Percent (%)**
Participant (n=94)	Staff	82	87.2%
	Student	12	12.8%
Age group (n=94)	<=20	8	8.5%
	21-30	41	43.5%
	31-40	30	32%
	41-50	14	15%
	>50	1	1%
Gender (n=94)	Male	29	31%
	Female	65	69%
Category (n=94)	Consultant	2	2.1%
	Post Graduate	8	8.5%
	Intern	2	2.1%
	Nurse - Medical	18	19.1%

	Nurse - Surgical	6	6.4%
	Technician	17	18.1%
	Attender	7	7.4%
	Sweeper	8	8.5%
	MBBS	6	6.4%
	Nursing student	2	2.1%
	AHS student	2	2.1%
	Research fellows	5	5%
	Others	11	12%
Total no of years been in CMC * (n=94)	<= 5 years	38	40%
	6 - 10 yrs	30	32%
	11 - 15 yrs	9	10%
	16 - 20 yrs	12	13%
	21 - 25 yrs	3	3%
	> 25	2	2%
* This includes years of study and work in CMC			

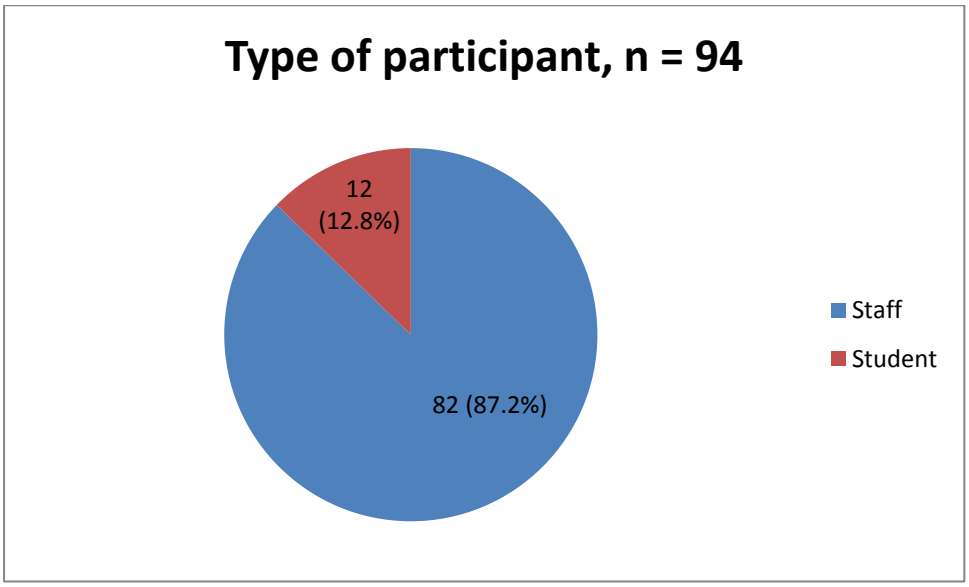
Table 1.b Further characteristics of staff in the study

Job status (n=82)	Confirmed	54	65.8%
	Non-confirmed	28	34.2%

Area of work (n=82)	Clinical	37	45.2%
	Non-clinical	45	54.8%

The figure below shows the distribution of type of participants in our study :

Fig.1 Type of participant

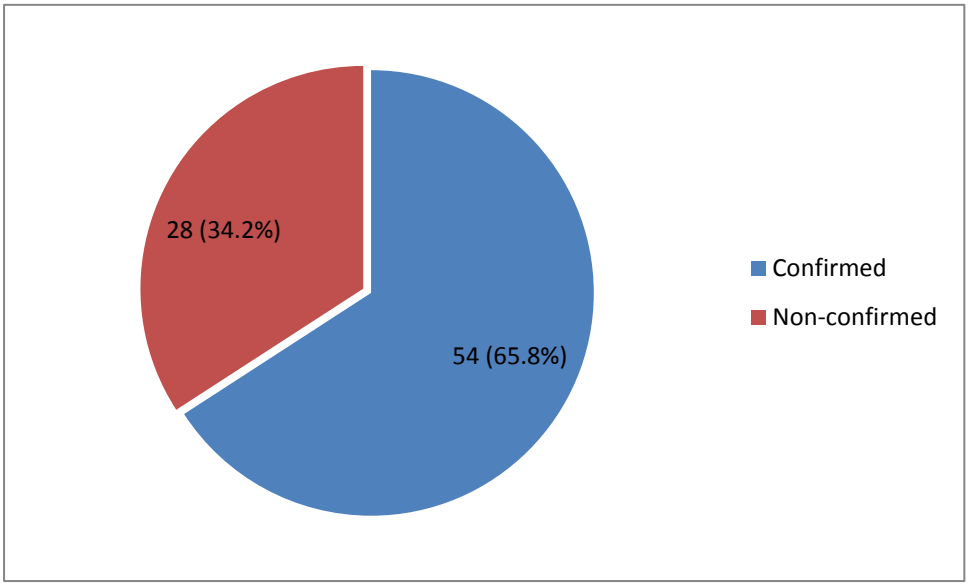


Of the 94 participants majority, 82(87.2%) were staff and the rest, 12 (12.8%) were students. In this study post graduate students were considered as staff. All the staff were on the regular payroll or were contract workers.

The staff were further classified as confirmed and non-confirmed workers.

The distribution of job status in our study is as follows

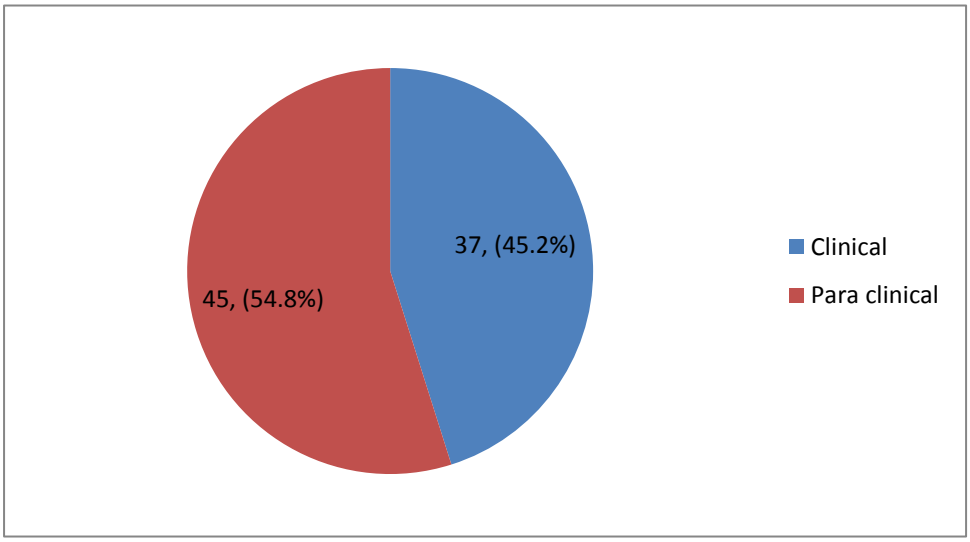
Fig.2. Job status of staff (n=82)



Of the 82 staff, majority, 54 (65.8%) were confirmed, 28 (34.2%) were non-confirmed staff. The proportion of confirmed staff was 0.0082 and that of non confirmed staff was 0.0095 with a 95% CI of (-0.0054 to 0.0026), making the difference not significant.

The staff in our study were distributed in the areas of work as follows:

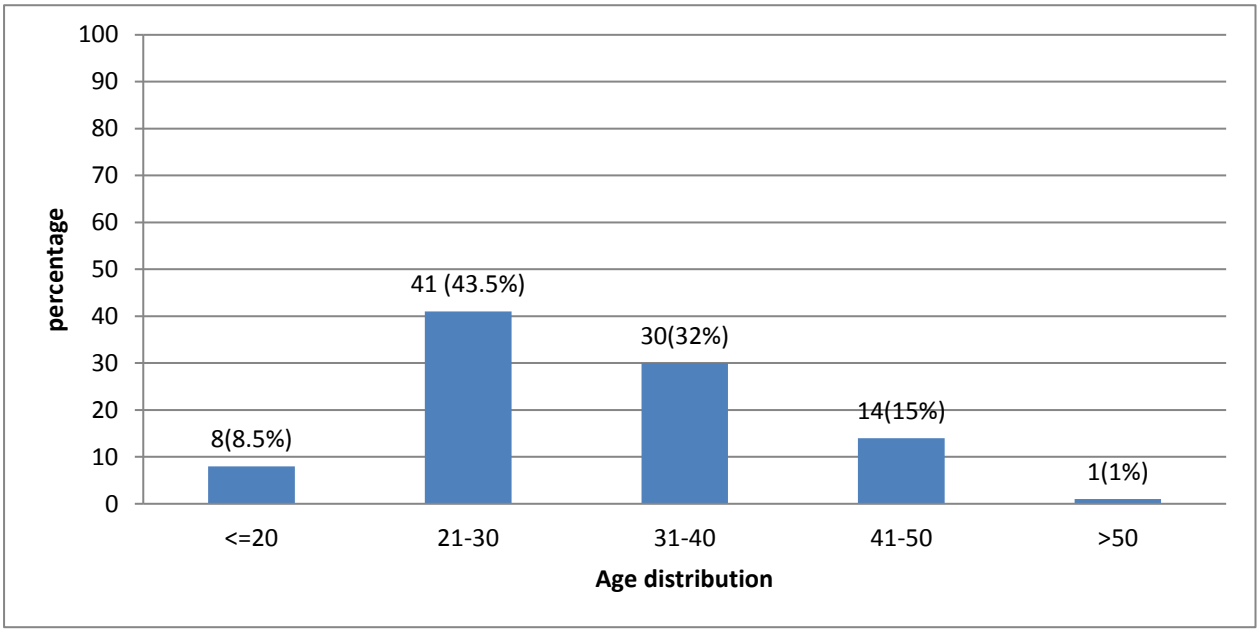
Fig 3: Distribution by area of work (n=82)



Most of the respondents (45/82, 54.8%) came from clinical areas which included wards, OPD and Operation theatres, and the rest (37/82, 45.2 %) from paraclinical areas.

In our study, age group distribution was as follows

Fig 4: Age group distribution (n=94)



The age of the participants ranged from 17- 52 years. The overall mean age was 31.53 (SD= 8.39) years and 31.89 (SD=7.60) in males and 31.36 (SD=8.77) in females respectively.

Table 2. Age distribution

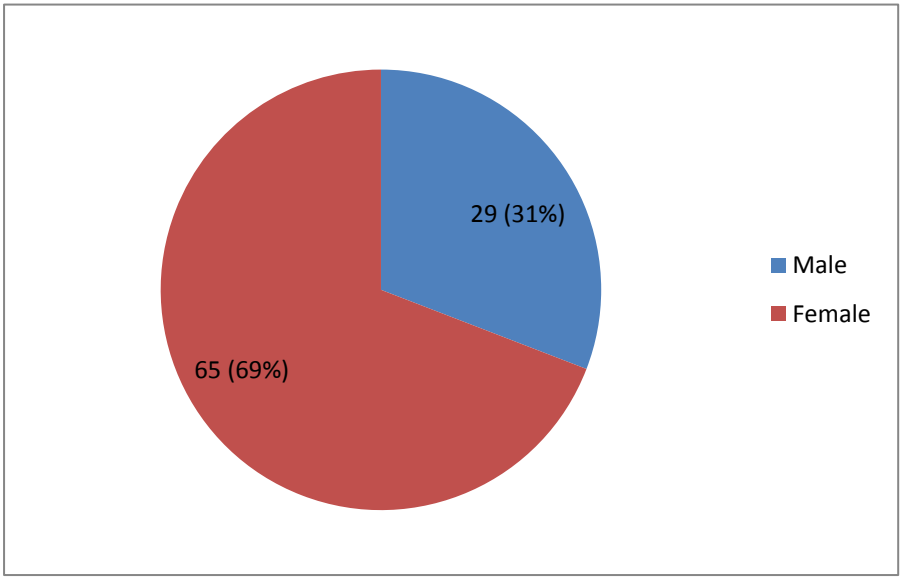
Males	**n = 29**	**Females**	**n = 65**
Mean (SD)	31.89 (7.60)	**Mean (SD)**	31.36 (8.77)
Median (Inter quartile range)	31 (27 – 37)	**Median (Inter quartile range)**	30 (25 – 38)
Range	17 - 47	**Range**	19 - 52

The study population was further divided into age groups less than and more than 30 years of age. Among them, 49/94(52.1%) were up to 30 years of age and 45/94 (47.9%) are above 30 years of age.

The test of proportions between the <30 years and >30 years age group in the study population of staff showed that there was a significant difference in the proportion of injuries and infectious hazards among the two groups, with a 95% CI of (0.0003 to 0.0082)

The gender distribution in our study participants was as follows

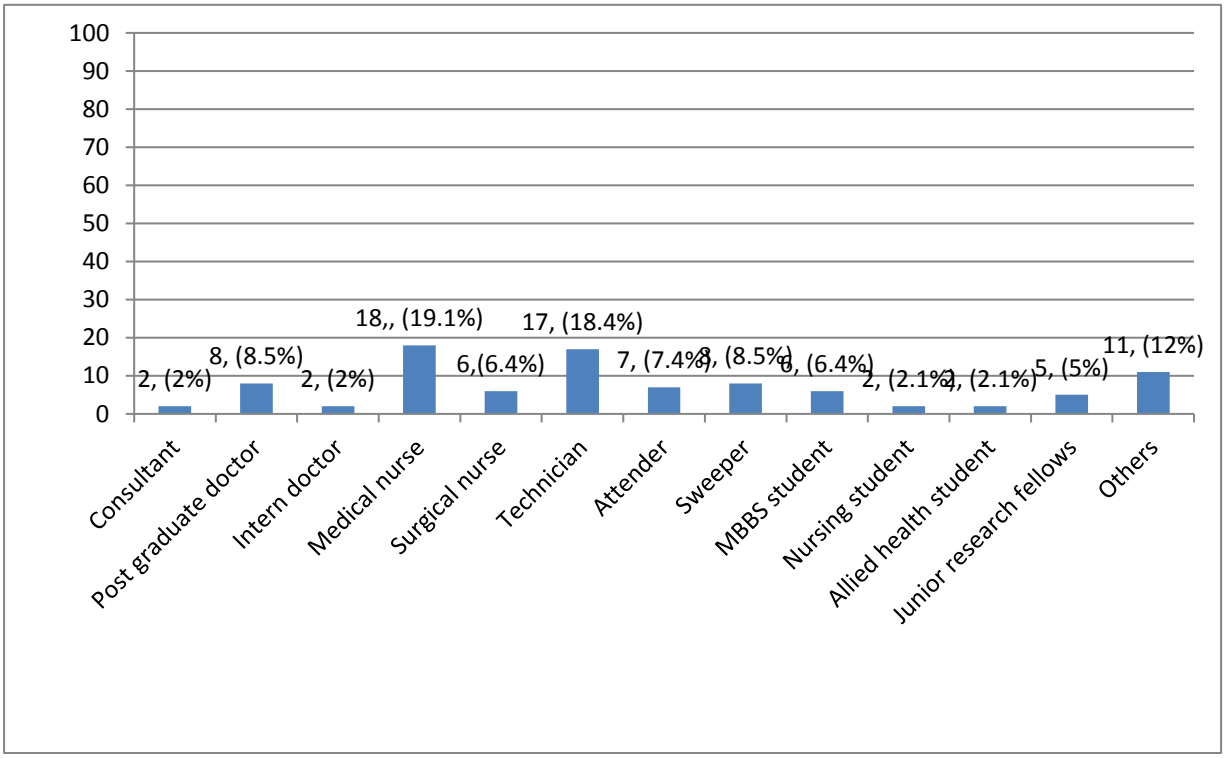
Fig 5: Gender distribution (n=94)



Of the total number of participants 65 of them (69%) were females and 29 (31%) were males. The overall proportion of males among all staff was 0.0064 and females was 0.010 with a 95% CI upper limit of(-0.0074) ,which made the difference significant.

The categories of the health care workers in our study was as follows

Fig 6: Category of the participant (n=94)

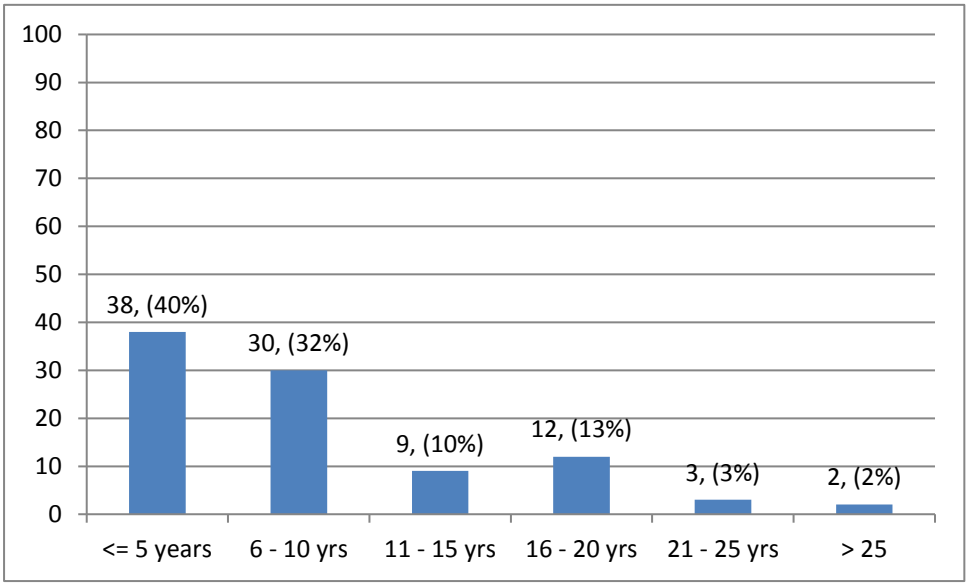


Among the various categories of staff, nearly a quarter, 24 out of 94 (25%), of reported exposures were from the nurses (medical and surgical), followed by technicians who reported 17 out of 94 (18%) and sweepers 8 out of 94 (10%). Others included plumber, administrator, clerk and other para clinical staff and students.

The experience of the study participants in the institution is as follows-

The total number of years of exposure to the institution's work environment and its safety practices was calculated by adding the number of years of study and work undergone in the institution.

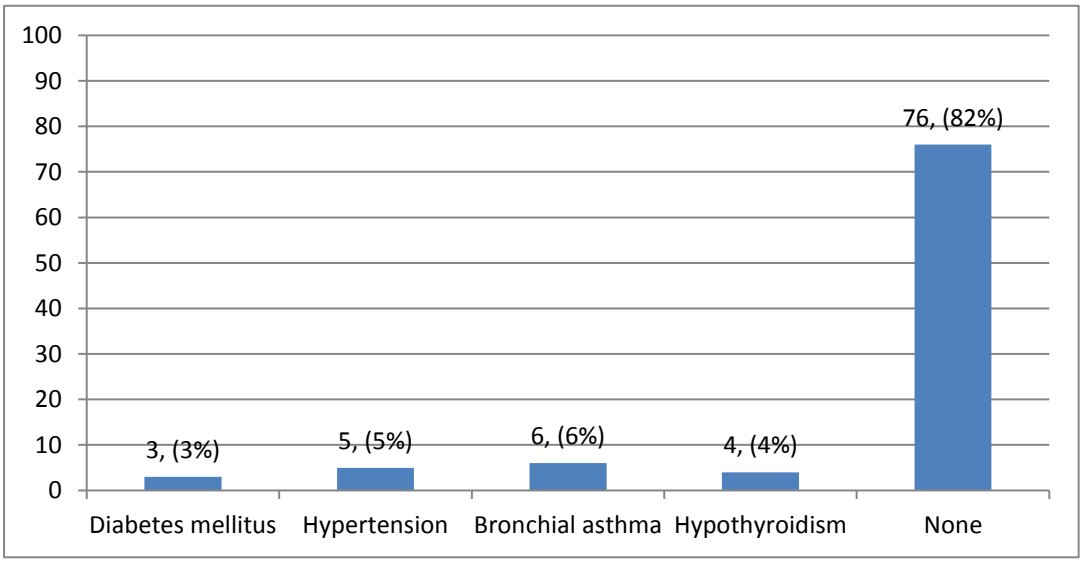
Fig 7: **Total no of years of experience in the institution (n=94)**



Of the respondents, 38 out of 94, (40%) had been in the institution for less than 5 years, 30 (32%) had been for 6 – 10 years, 9 (10%) were there for 11-15 years, 12(13%) for 16-20 years, 3 (3%) for 21-25 years, 2(2%) for >25 years

The distribution of systemic co morbidities in our study is as follows

Fig 8: **Systemic co morbidities (n=94)**

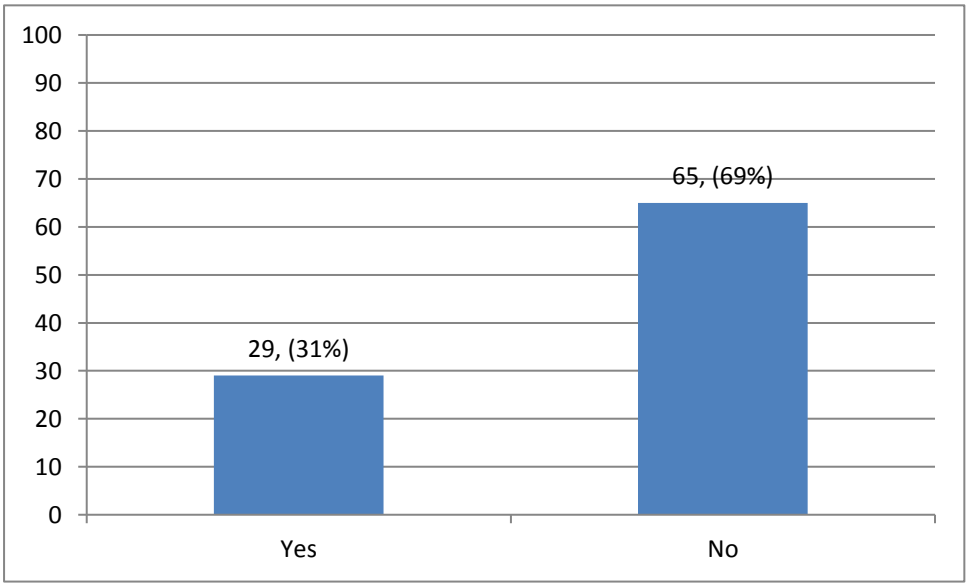


Of the total respondents, majority (76/94) 81% had no co morbidities, 3 had diabetes, 5 had hypertension, 6 had bronchial asthma, and 4 had hypothyroidism. All were on medication and well controlled.

The distribution of refractive error and other eye co morbidities in our study participants is as follows

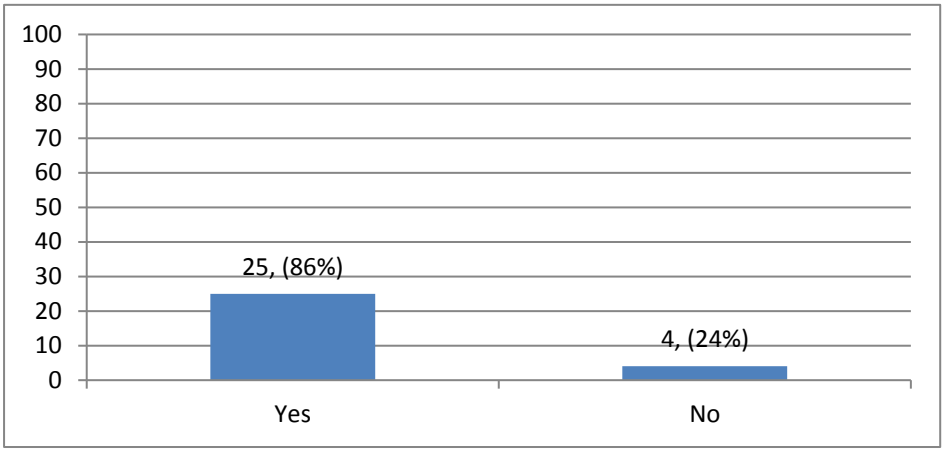
Of all, 4 respondents had pre existing eye morbidity. They were as follows – corneal dystrophy (1), Primary open angle glaucoma (1), and Corneal scar (1) Allergic conjunctivitis (1)

Fig 9 : Refractive error (n=94)



Of the total number of respondents, 29 (31%) had refractive errors.

Fig 10: Wearing glasses (n=29)



Among the 29 participants with refractive errors, 25 (86%) were regular spectacle users**.**

Distribution of hazards among the study participants was as follows

The hazards reported were of the following types:

Table 3: Distribution of various hazards among study participants

Type of hazard	Frequency	Percent
Chemical	26	25.5%
Blood & Body fluids	7	9.6%
Chemical + BBF	6	6.4%
Blunt trauma	1	1.1%
Foreign body	3	3.2%
Sharps	0	0%
Allergic conjunctivitis	4	4.3%
Infectious conjunctivitis	47	50%
Total	**94**	**100%**

Of all the hazards that were seen (n=94), infection of the eye (infectious conjunctivitis) were numbering 47 (50%). Among the other hazards chemical injuries to the eye was majority numbering 24 (25.5%), blood and body fluids 9 (9.6%), combined chemical and blood and body fluid splash 6 (6.4%), blunt trauma 1 (1.1%), foreign body 3 (3.2%), allergic conjunctivitis 4 (4.3%) respectively. There were no reported sharps injuries to the eyes during the study period.

Table 4: Chemical exposure (n=32)

Chemical splash (32 incidents)		**Frequency**	**Percent**
Type of Chemical	Disinfectants	22	68.75%
	Anaesthetic agents	6	18.75%
	Injectable drugs	1	3.0%
	Others	3	9.5%
Protocol followed (Y/N)	Yes	13	41%
	No	19	59%

Of the 32 incidents of chemical exposure, seven were of chemical mixed with blood and body fluids. Twenty two (68.75% were from disinfectants that included Lysol, formalin, cleaning acid, harpic, sodium hypochorite, cidex, hydrogen peroxide and sterillium. Of these Lysol and formalin splashes were commoner than the others (6 out of 22 each). The severity of all chemical injuries in our study participants was RoperHall Grade 1 and none of them had loss of vision. Of all those who had splash

exposure to the eye with chemicals 59 % (19/32) had not followed the recommended first aid measure of 15 minutes washing in running water.

Blood and body fluids hazard exposure

Of the 94 respondents, 7 were exposed to primarily Blood and body fluids whereas 6 were exposed to blood and body fluids mixed with chemicals. Four of these 6 were exposed to Hepatitis C positive blood contaminated formalin and were followed up to be negative for blood borne virus infection subsequently.

There was one case of blunt trauma, and there was one corneal and two conjunctival foreign bodies with no loss of vision.

Infectious conjunctivitis:

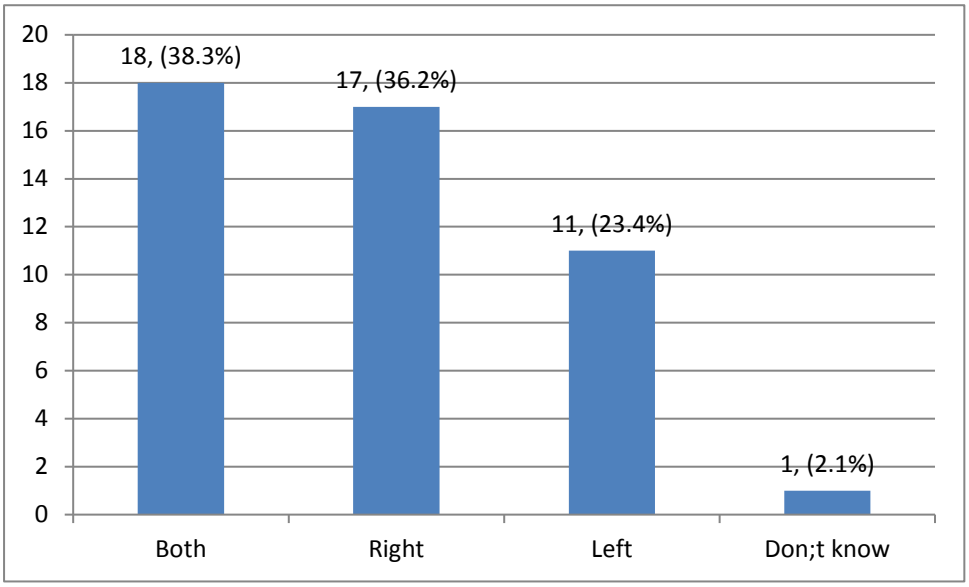
Among those who presented with infectious conjunctivitis the distribution of factors was as follows-

Of the 47 respondents who presented with infectious conjunctivitis, 31 (66%) came within 3 days of developing eye symptoms, 10 (21.2%) of them came within 4-7 days and 6 (12.8%) of them came more than a week after developing symptoms. Of all those who had presented with infectious conjunctivitis, 23.4 % (11/47) each gave history of contact with conjunctivitis cases at workplace or at home. Four of them (8.5%) had been to the eye hospital in the week prior to developing symptoms. Of the rest, 5 reported to have had contact with infectious persons at other places and 16 did

not know the source of infection. There were five participants, who developed nummular keratitis, but their vision improved after treatment.

The distribution of involvement of side of the eye in our study participants was as follows

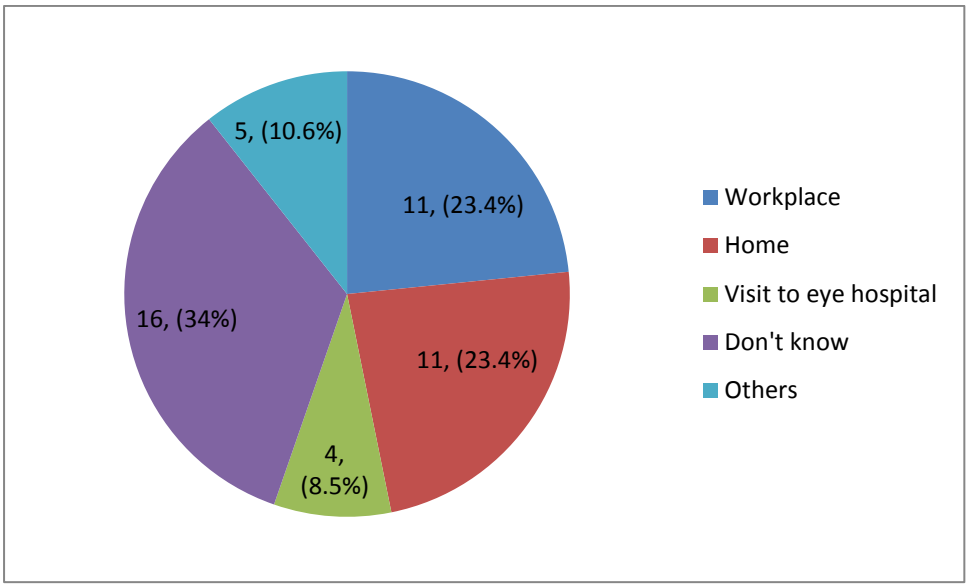
Fig.11 Side of eye exposed to hazard



Of all those who had non infectious hazardous exposures to the eyes only 1 (2.1%) was unsure about the exposed side, while almost equal numbers of those who responded positively had had a splash in either the right (17, 36.2%) or both eyes (18/47, 38.3%). Comparatively fewer (11/47, 23.4%) had exposure to the left eye.

Among the infectious conjunctivitis group, the history of contact was as follows

Fig 12 History of contact in infectious conjunctivitis group (n=47)



Out of the 47(50%) respondents with infectious conjunctivitis, 11 (23.4%) had reported having contact with a person with conjunctivitis recently at the workplace, 11 people (23.4%) had history of contact from someone at home, 4 people (8%) had history of visiting the eye hospital for other reasons within the previous week, 16 people (35%) did not know if they had any contact with an infectious source and 5 of them (12%) had contact with an infectious conjunctivitis source other than from the above sources.

Those who got the infection from family were included as there could be confounding due to the fact that symptoms may have developed at earlier stage in one which could have gone unrecognised.

Eight of the 47 (17 %) who had been exposed to a non infectious hazard, reported to have had previous such incidents at the workplace.

The best corrected visual acuity of all 94 participants was better than 6/18.

5. D. Risk Factors among the study participants

Type of participant as a risk factor was compared with occurrence of injury or infection

Table 5: Type of participant vs Injury/ infection

Category of participant	**Injury**		**Infection**		**Total**	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Staff	41	87.2%	41	87.2%	82	87.2%
Student	6	12.8%	6	12.8%	12	12.8%
Total	**47**	**100%**	**47**	**100%**	**94**	**100%**

Chi= 0.00, p value = 1.0

There was no statistically significant difference between category of HCW (staff or student) and type of hazard (injury and infection) ; p value of 1.0.

Job status as a risk factor, permanent to temporary HCW was compared among study participants

Table 6 . Job status vs Injury/ infection

Job status	Injury		Infection		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Confirmed	26	63.4%	28	68.3%	54	65.9%
Unconfirmed and Project	15	36.6%	13	31.7%	28	34.1%
Total	**41**	**50%**	**41**	**100%**	**82**	**100%**

Chi square= 0.217, p value= 0.641

There was no association between job status and occurrence of injury/infection.

The area of work as a risk factor for injury and infection was compared among study participants

Table 7. Area of work vs Injury/ infection

Area of work	Injury		Infection		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Clinical	23	56.1%	14	34.1%	37	45.1%
Para clinical	18	43.9%	27	65.9%	45	54.9%
Total	**41**	**100%**	**41**	**100%**	**82**	**100%**

Chi=3.98, **p value=0.046**

There was a significant association between area of work and occurrence of injury and infection.

Age as a risk factor for injury and infection was compared among study participants

Table 8. Age group vs Injury/ infection

Age	**Injury**		**Infection**		**Total**	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Upto 30 years	27	57.4%	22	46.8%	49	52.1%
More than 30 years	20	42.6%	25	53.2%	45	47.9%
Total	**47**	**100%**	**47**	**100%**	**94**	**100%**

Chi= 1.066, p value = 0.302

There was no significant association between age groups and occurrence of injury and infection.

Gender as a risk factor for injury and infection was compared among participants

Table 9. Gender vs Injury/ infection

Gender	**Injury**		**Infection**		**Total**	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Female	33	70.2%	32	68.1%	65	69.1%
Male	14	29.8%	15	31.9%	29	30.9%
Total	**47**	**100%**	**47**	**100%**	**94**	**100%**

Chi square= 0.05, p=0.823

There was no statistically significant difference in the occurrence of injury or infection between the male and female gender.

Years of experience was compared among study participants for occurrence of injury and infection

Table 10. Years of experience vs Injury/ infection

Years of experience (study+work)	**Injury**		**Infection**		**Total**	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Upto 10 years	37	78.7%	32	68.1%	69	73.4%
> 10 years	10	21.3%	15	31.9%	25	26.6%
Total	**47**	**100%**	**47**	**100%**	**94**	**100%**

Chi=1.362, p value= 0.243

Test for significance using between years of experience, 10 years age group and more than 10 years group versus injury and infection groups was not found to be statistically significant with a p value of 0.243

Wearing glasses was compared among study participants for occurrence of injury and infection

Table 11 Prescription glasses use vs Injury/ infection

Wearing spectacles?	**Injury**		**Infection**		**Total**	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Yes	7	85.1%	18	61.7%	25	73.4%
No	40	14.9%	29	38.3%	69	26.6%
Total	**47**	**100%**	**47**	**100%**	**94**	**100%**

Chi = 6.594, **p value = 0.01**

Test for significance using between those wearing spectacles and those not wearing spectacles versus injury and infection groups was found to be statistically significant with a p value of 0.01

Among those reporting injury, we determined the strength of association using logistic regression for those risk factors alone which proved significant in the initial analysis. The results are as follows:

Table 14. Logistic regression analysis (n =47)

Risk factors		**OR(95%CI)**	'p' value
Wearing glasses	Yes(R)	1	**0.048**
	No	**3.1 (1.11 to 8.6)**	
Area of work	Clinical	**2.46 (1.01 to 6.018)**	**0.03**
	Paraclinical (R)	1	

When compared with staff who wore glasses , those who did not had 3.1 times higher risk of injury (1.11to 8.6) which was found to be significantly different with a p value = 0.03

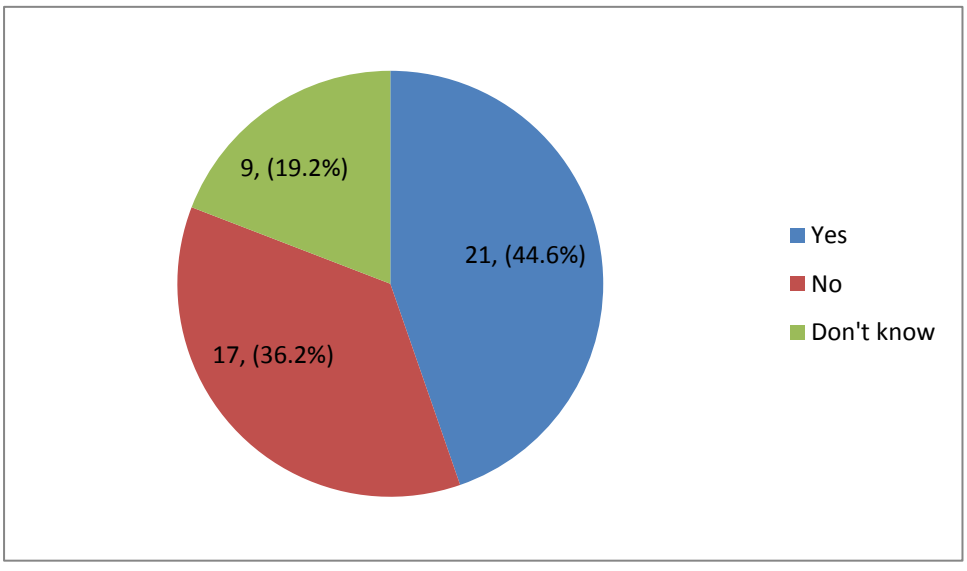
Clinical group had a 2.46 times higher risk of having an injury when compared with the para clinical group (1.01 to 6.018), p = 0.048. However , the 95% CIs are large due to small numbers.

5. E. Personal protective equipment usage

Among the study participants who had injurious exposure to the eye, awareness regarding PPE usage was as follows-

While 44.6% (21/47) responded that they had PPE readily available at the workplace, more than 50% of them responded that they either did not have or had no idea about PPE availability.

Fig 13 Availability of PPE at the workplace (n=47)



Only 13 of the 47 participants (27.6%) of those who had hazardous exposures to the eye responded that PPE was regularly used however 24 of them (51.1 %) of them did not use and 10 of them (21.3%) were not sure if it was being regularly used.

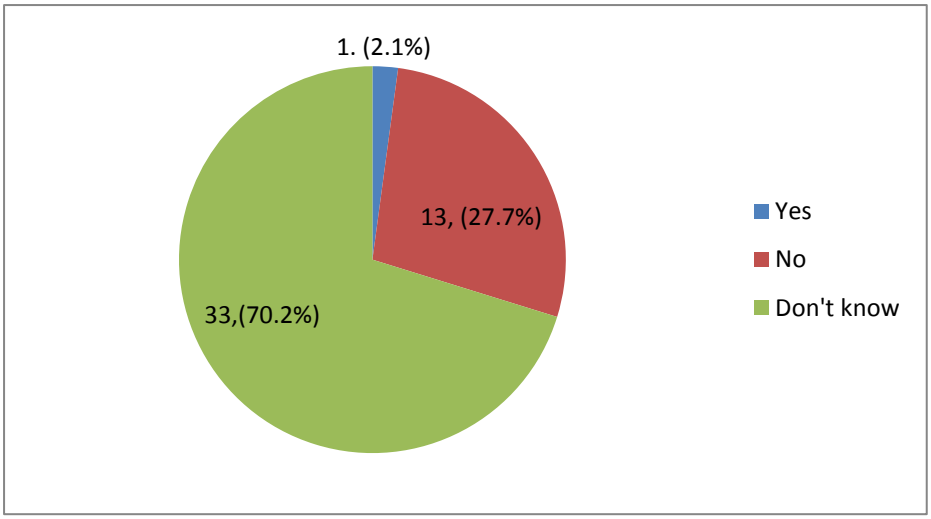
Of the 47, only 15 (31.9%) said that PPE was handy and ready to use. 15 (31.9%) of them said that they did not have them handy and 17 of them (36.2%) were not aware.

Of the 47 only 18 (38.4%) said they had undergone some training of educational program on PPE usage , however 16 (34%) said they did not receive and 13 (27.6%) said they did not know if they had received any such training.

Nearly 30% (14/47) of the respondents said that PPE were well fitting, whereas 36.2% (17/47) said that the PPE were ill fitting and 34% (16/47) said that they did not know.

Of the respondents, only 1 (2.1%) responded that the PPE used was appropriate for the job that exposed them to the hazard, whereas 27,7% (13/47) and 70.2% (33/47) of them responded that the PPE was not appropriate and they don't know if it was or not.

Fig 14. Was the PPE appropriate?(n =47)



Sickness absenteeism among the study participants was as follows

Table 12: Sick leave days (n =94)

Sick leave days	
Mean(SD)	2.027 (SD=2.539)
Median (IQR)	1 (0-3)
Range	0-24 days

The number of sick leaves ranged from 0- 24 days. The mean number of sick leave days was 2.26 (SD=3.39). Among those with non infectious hazards the mean was 0.75 (SD=0.935). Among those with infectious hazard the mean was 3.277 (SD=2.96)

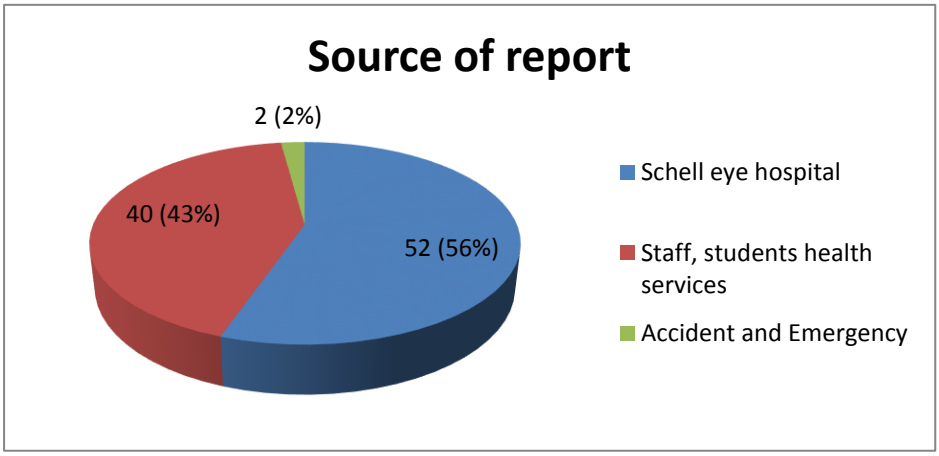
Those who presented with blood and body fluid splashes were all negative for blood borne virus screening blood test at subsequent follow up visits.

5.F.Reporting

The participants reported incidents of eye injury and infection to one of the points of first contact.

The source of report was either the Schell eye hospital (ophthalmology department), Staff, students health services or Accident and emergency departments

Fig 15. Source of report (n=94)



A total of 94 participants were enrolled in the study. Of these 52(55.3%) reported the incident first to Schell eye hospital, 40 (42.6%) reported the incident to Staff, students health services (SSHS) and 2 (2.1%) reported first to the adult Accident and Emergency department.

The time taken to report in non infectious hazards among the study participants was as follows

Table 13. Time to report non- infectious hazards: (n=47)

Time taken to report	**Frequency**	**Percent**
< 24 hrs	43	92%
> 24 hrs	4	8%
Total	**47**	**100%**

Among the non infectious group, 43/47(92%) reported with in 24 hrs of incidence of hazard, and 4/47 (8%)reported after 24 hrs of the occurrence of hazard

Fig 16. Reporting in Non- infectious hazards: (n=47)

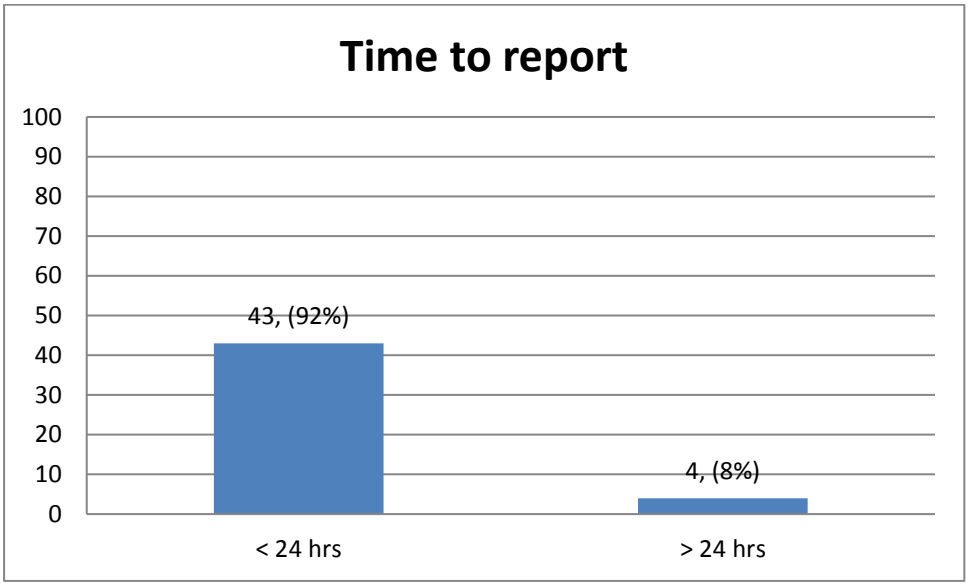
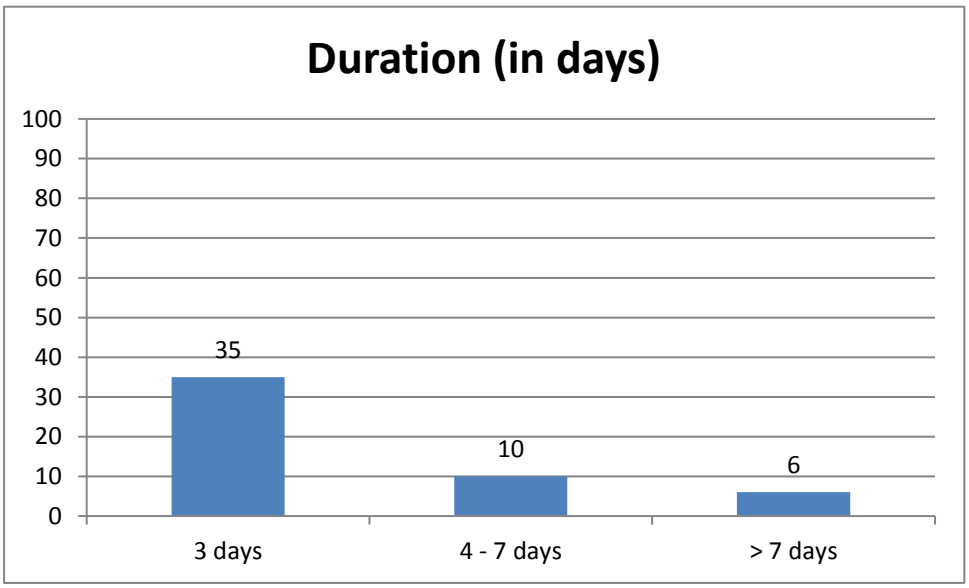


Fig 17. Reporting in cases of conjunctivitis



Of the 47 infectious conjunctivitis, majority of the participants 31 out of 47(66%), reported within 3 days of developing symptoms, 10 of them (21.2%) reported between 4 -7 days after developing symptoms and 6 of them (12%) reported a week after developing symptoms. The mean time to report was 3.79 days (SD 3.53)

Cost analysis

The mean cost incurred as a result of an exposure to either an infectious or non-infectious hazard to the eye calculated approximately was Rs. 643.22. (SD=749.23) The cost of treatment (indirect and direct) ranged from a minimum of Rs.178.80 in simple conjunctivitis to Rs.3215 for blood splashes which required blood borne virus screening and follow up for the same. The median cost was Rs 338.29.

6. Discussion

This observational study reports the incidence of acute eye .hazards, injuries and infections among health care workers over a period of 6 months.

Incidence of various hazards.

The incidence even if evidently under reported is as high as 8 per 1000 for a period of 6 months. There are very few studies which report this in the world and none from India to the best of our knowledge. The incidence of non infectious hazards sub group alone in our study was (47/11420) 4 per 1000. This when compared to a study done in South Africa which showed that the annual incidence of eye injuries among those in agriculture was 3.46 per 10,000 people and in construction workers was 5.3 per 10,000 people makes it a significant finding of a much higher incidence as compared with other industries and thus highlights the significance of the findings in healthcare settings.(1)

Demographic Factors

Age groups and gender

The demographic factors in this study are discussed below. In the population that was studied, the age of the participants ranged from 17- 52 years. The overall mean age was 31.53 (SD= 8.39) years and 31.89 (SD=7.60) in males and 31.36 (SD=8.77) in

females respectively. This was comparable to data available from a similar teaching hospital setting in Nigeria where an observational study was conducted among all strata of workers in a hospital and included all age groups where the range of age was from 21- 60 years(2) The mean, median and mode ages in the respondents were 34.6 (± 7.88) years, 33 years, and 30 years respectively and slightly higher than our study which could be attributed to the fact that undergraduate students were also included.

The study among our staff and students showed the largest number of respondents (41/94, 43.5%) fell in the 21-30 years category. When divided into 2 groups in our analysis (< and > 30 years), 57.4% were in the <30 years age group. These results when compared to the demographic data of another large teaching hospital In Nigeria, in a comparable study population, majority were in the age group of 31-40 years (30%), This difference could be attributable again to the inclusion of students who mostly belonged in the lowest age group category (8/94, 8.5%). In a study by Kermode et al(2) in a group of small hospital in rural North India, the average age of the 266 participants was found to be 30.5 years with a range of 18- 62 years and standard deviation of 10.3. These results were comparable with our findings though in a tertiary care setting.

The test of proportions for age groups in our study showed that there was a significant difference in the proportions. We included students to highlight that trainees in health care are also at risk. Therefore it is all the more important to include preventive strategies for them(3)

There was a significantly higher proportion of females (69%) in our study. Kermode et al in their study also found that majority were females among the participants of 7 rural healthcare institution personnel (77.9%). The fact that the medical/surgical nursing group of employees reported the highest number of hazards could be a contributing factor to this observation.(2)

According to the finding in a study done in Ethiopia among industrial workers, male workers were about 2.5 times more likely to report occupational injury than female worker. This was explained as due to high willingness of male workers and tendency to engage in risk-taking behavior than female workers who tend to avoid risk taking at the workplace (4). In our study however, there was no difference in the severity of injury between genders.

Job profile of participants

Job category wise distribution of the study population in this teaching hospital showed 82 staff belonging to the following categories. Two (2.1%) consultant level doctors, 8 postgraduate registrar level doctors (8.5%), 2 medical interns (2.1%) , nurses totally constituted 24 (25.5%), 17 (18.1%) technicians, 15 (16%) belonged to the attender and sweeper category. Students made up 12.8% (12/94) of the study group. A similar category wise profile of healthcare workers with occupational hazards could not be found in literature in a similar tertiary healthcare setting. Hence these study findings will be a useful comparison in the field of occupational health

Visual outcomes

There were no sight threatening injuries our study during this six month period, however the nature of injuries suggest that it can happen if adequate precautions are not taken.

Types of injuries

Blood and body fluids

Of all the respondents in our study 7 (9.6%) had mucocutaneous exposure to blood or body fluids and 6 more (6.4%) had exposure to blood or body fluid contaminated chemicals- a total of 13 exposures over a 6 month period. The previous year's register had shown that there were about 30 cases out of a total of 317 incidents reported over a 1 year period. Mucocutaneous exposures to BBF are a unique hazard faced by healthcare workers. Health care workers, laboratory staff, janitorial workers, animal handlers, and other workers may be at risk of acquiring infectious diseases via ocular exposure. Kermode et al also reports from their study a mean mucocutaneous exposure rate of 1.67 (4.0) with 21% of all respondents reporting more than one such exposure in the preceding year. A study among dentists in Bologna, Italy showed that of 63 reported exposures to blood and body fluids 11% were mucocutaneous involving a splash to the eye(5) A study done in Costa Rica over 6 month period which was also similar to our study among hospital employees showed that eye /mouth splashes accounted for 15.9% of all work related injuries(6) which is similar to the approximately 15% exposure seen in our study (BBF and mixed splashes). The institution where our study was undertaken has a strict protocol to ensure 100%

immunization of all staff and students and links the salary of the staff to the follow up immunization which ensures near 100% compliance to Hepatitis B vaccination schedule thus ensuring adequate protection.

Foreign body

Three of all the respondents reported as having suffered from a foreign body in the eye at the workplace. In our study there were more males (2/3, 66.6%) among those who reported foreign body in the eye and had mild findings consistent with the injury. A study done in South China among all ocular trauma presenting to a hospital showed that of the 1055 total patients, approximately 42.9% of the injuries were work-related and metal was the most common cause for the occupational injury group, with 315 (69.5%) cases(7)

Chemical injuries

Of the 47 non infectious hazards reported, 32 incidents were of chemical exposure; disinfectants were the commonest. Of the total number 7 were of chemical mixed with blood and body fluids.

The study done in Costa Rica among healthcare personnel showed that workers exposed to chemicals had a higher rate of work related injury (RR 1.26) as compared to non exposed workers(6) Another study done on occupational health hazards among healthcare workers in Kampala, Uganda estimated that chemical injuries can contribute up to 10% of all work related injuries(8). Our study showed it to be nearly a

quarter (25%) of all work related eye hazards. There are no reports with eye hazards alone to make comparisons.

Eight of the 47 (17 %) who had been exposed to a non infectious hazard, reported to have had previous such incidents at the workplace which suggests that there could be risk of recurrent injury and which can be preventable with safety interventions.

Infective conjunctivitis

Hitherto work related eye injuries have not traditionally included infections but we decided to include this as in our practice we have commonly encountered this to be a problem and wanted to document the burden in our institution. This seems to be a reasonably large burden almost as much as other hazards and therefore deserves attention.

In work related conjunctivitis, cross-infection may occur through contaminated instruments, hands, common towels and droplets. Personnel with dry eye or inadequate lid closure are more susceptible to developing infections of the eye. Our study found that of the 94 who reported an acute incident to the eye, 47 (50%), (41 staff and 6 students) had reported to have had conjunctivitis and majority (66%) reported within 3 days of developing symptoms. A study done among students in a campus in Dartmouth showed that attack rates among 3682 undergraduate and 1378 graduate students were 18.7percent and 2.5 percent, respectively whereas the staff at the health clinic did not develop symptoms. The mean duration of symptoms was 5.9 days (range, 1 to 43) which was higher than in our study which showed mean time to report was 3.79 days (SD 3.53)A study done in Kampala among 200 healthcare

workers showed that infections accounted for 7.5% of work related hazards in a healthcare setting of the 100 (50%)respondents(8)

The hospital employs personnel in various areas. Some areas like wards, operation theatres and OPDs being areas of clinical practice, other areas of work included laboratories and other para clinical areas where patient contact was comparatively less but was integral in the functioning of the hospital as a whole. Sub classification of the employees done in this study by area of work and job status to enable better understanding of the risk. Our results showed that more than half (52/94, 55.3%) of the study respondents belonged to the clinical group of hospital employees which included predominantly doctors and nurses at various levels of experience and in areas such as OPDs, operation theatres and wards. Of the rest 23.4% (22/94) were from para and non-clinical areas of work and 21.3% (20/94) belonged to laboratory areas. Our study showed a statistically significant difference in the two groups in occurrence of injury and infection.

Among healthcare workers it has been studied earlier that those with longer period of exposure to an institution are more likely to know safety and health practices and hence would be less predisposed to occupation related illness and injury. However there was no statistical significance in our study. Meta-analysis of studies mostly done in the United States and European Union among a variety of industries including healthcare found that 7 of the 13 studies which were selected showed an increased risk

of occupational injury among temporary workers(9). In our study there was no significant difference between temporary and permanent employees.

Awareness about protective equipment availability (44.6%) and regular usage (27.6%) was found to be overall less as was highlighted in the results. This was compared to a study in Nigeria among healthcare workers where the 37% out of 276 respondents had a fair knowledge of PPE usage(10). This study was conducted in a NABH accredited institution that makes available PPE for regular use and also ensures that they are easily available and constantly supplied to all areas. Therefore a low awareness and other barriers such as inconvenience due to usage or poor fit of PPE may be the reasons behind this finding. Almost 70% had said that the PPE were poorly fitting. This therefore may be another reason for poor compliance with regards to PPE usage.

Only 38.4% had responded as having had training of any sort on PPE usage. This shows that regular training may be required for reiteration and reinforcing regarding regular usage of PPE. A case control study done in Ethiopia, aimed at identifying various factors contributing to injury among industrial workers showed that lack of training, made workers to be at a higher risk of occupational injury health and safety training (AOR 1.85, 95% CI (1.17, 2.91).(4) Ansari et al., 2013 and Alani et al concluded on their studies that PPE usage must be advocated in order to protect from even microscopic splatter that may be missed by the naked eye(7,12). A longer duration study (preferably 1 complete year) with focus on these issues would yield specific results and shed light on this aspect of preventive occupational health.

Wearing of spectacles seemed to have a protective effect against injury whereas there seemed to be a higher risk of developing conjunctivitis in those who wore spectacles (Table1). It could be reasoned that the spectacles act as a barrier against physical and chemical hazards but were not helpful or even contributory in harbouring organisms that could cause infectious conjunctivitis.

Sickness Absenteeism

The mean number of sick leave days was 2.027 (SD=2.539) in our study. Among those with non infectious hazards the mean was 0.75 (SD=0.935). Among those with infectious hazard the mean was 3.277 (SD=2.96). Loss of productivity with respect to sickness absenteeism due to eye related illness was reported in a Brazilian study done among nursing staff in 2011 as 3.17 days(13) Our study shows lesser average sick leave absenteeism as compared to this Brazilian study. Studies done among healthcare workers with regards to eye hazards are lacking to make any comparisons.

The staff and students of the institution where this study was conducted make use of a dedicated reporting system which is already in place to self-report needlestick injuries and muco cutaneous exposures to blood and body fluid at the workplace day or night throughout the year with an on call duty doctor. This study took advantage of the existent system and added to it the reporting for eye injuries and infections and used other methods as already mentioned to augment reporting. The system though time tested, may have been a bit cumbersome due to the fact that after reporting the incident or illness the person would have to make one visit to the ophthalmology department which was located away from the main hospital premises. This may have

led to under reporting. According to a study done in the United States which looked at reporting behaviour among healthcare workers in an acute care setting 105 of 455 (23.1%) reported a muco cutaneous exposure during their career of which majority (82.9%) were not reported. This alarming rate of under reporting highlights that this problem exists in developed countries and is likely to be worse in the developing countries like India where many hospitals do not have such systems in place. Studies to measure under reporting need to be undertaken in India. The most common reason for not reporting in the study was the belief that the exposure was not significant, followed by the combination of believing the exposure was not significant and being too busy to report(14) The fact that not a single employee from the dental department reported an infectious or non infectious incident to the eye may be due to the fact that they currently are designing a study regarding occupational injuries among dental personnel.

The fact that the mean cost for care of one HCW reporting with an acute eye hazard is over Rs 600/-, also highlights this aspect in addition to threat to vision/ absenteeism and in cases of infectious conjunctivitis them being a source of infection for other workers while in the incubation period of the disease.

While we suspect underreporting, even those figures obtained as a result of this study, are a useful estimate of exposure to hazards whose burden has been poorly known till now. The distribution, risk factors, use of PPE, reporting and cost estimates will further help us to plan health education, protocol implementation and improved reporting measures in areas of high risk.

Finally this data can be used to plan further research to explore other important aspects of work related exposure of eyes of health care workers to hazards..

7. Conclusions

- There is at least a burden of 8/1000 of acute work related infectious and non infectious hazards to the eye among healthcare workers in a tertiary health care setting during a six month period. Students are as much at risk as the staff.
- Chemical splashes make up nearly 25% of all reported work related hazards to the eye
- Factors that may be associated with work related injuries to the eye are spectacles usage, working in clinical areas
- Awareness regarding PPE usage is less among the staff and students of the institution and may need educational and other intervention with multi departmental cooperation
- WREI does contribute to sickness absenteeism which can be prevented by appropriate measures
- There is a considerable cost for care with both non infectious and infectious hazards
- There were no visually blinding injuries or infections in this study

8. Limitations

- There must be a degree of under reporting in this study considering the large work force, location of the ophthalmology department in another premises and general perception that these exposures are inconsequential.

  Future studies will need to include strategies to improve this.

- The study was conducted over a limited time period of 6 months. A study conducted over a larger time period may yield more conclusive results

- The exact denominators for all categories among all HCW were not available for further comparison. Also whether the employee was wearing a PPE at the time of the injury was not asked directly

9. Recommendations

- The findings from this study could be used to put protocols and preventive practices and targeted training programs in place as well as plan further research
- The reporting system could be made less cumbersome to encourage better reporting, by equipping and training the in house staff students health services personnel in management of minor injuries and infections and making it an ongoing surveillance measure by the occupational health team
- Regular audits of the incidents reported must be discussed by the occupational health team and issues brought up at appropriate forum (which already exists for blood and body fluid exposures) to sort out any issues of concern.
- Awareness regarding safe practices and PPE usage should be reinforced at regular periods using multi pronged strategies for prevention.
- A larger duration study could be undertaken in more detail to study the effect of seasonal variations and educational interventions to create awareness on improved reporting behaviour if any.

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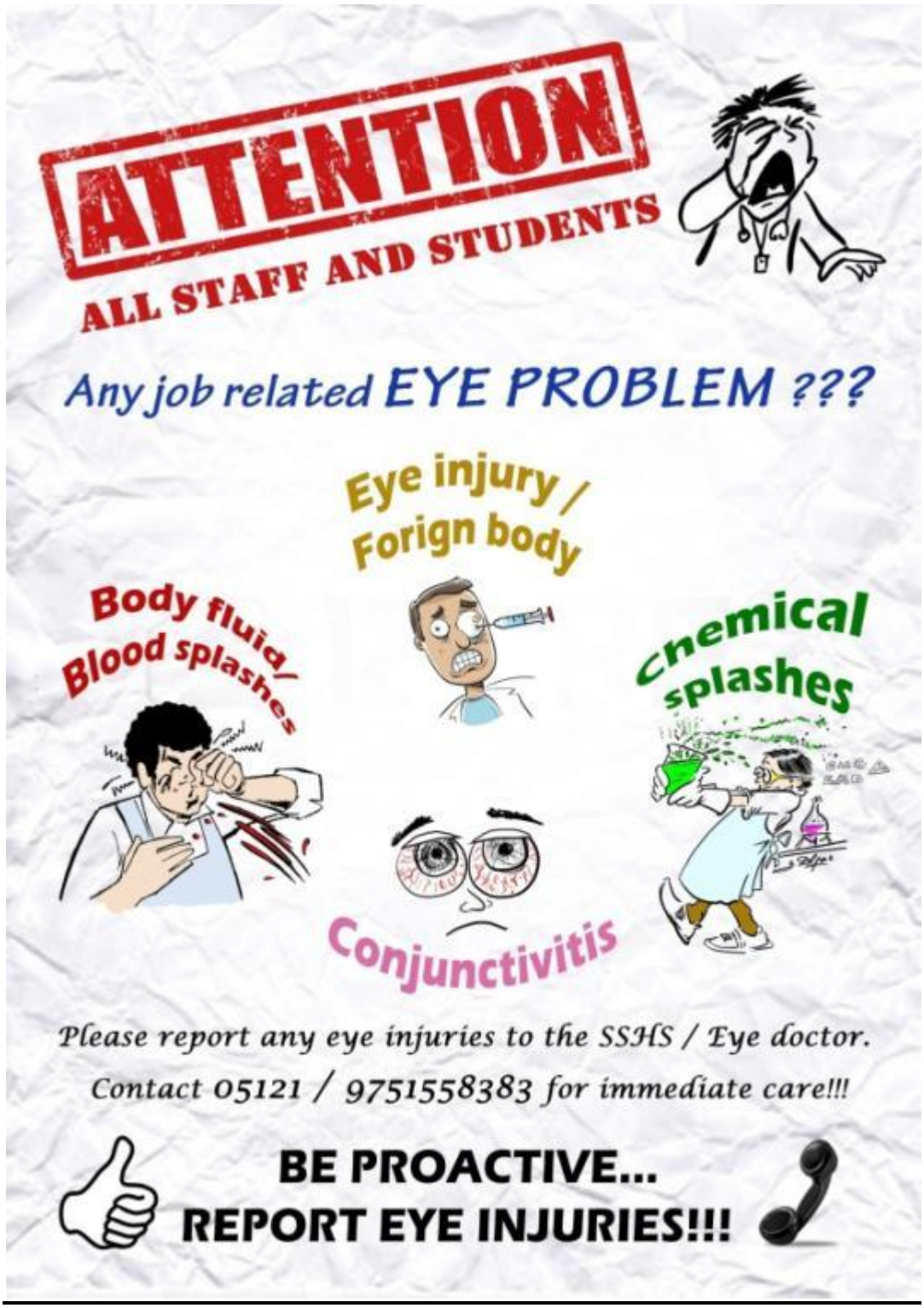
11. Annexures

Annexure 1- Poster



Annexure 2- Questionnaire

1. Serial no
2. Source of report: Schell/SSHS/Accident and Emergency/CHAD/Others_____
3. Staff/ Student
4. Emp no/ NA
   A. If staff: Job Status 1. Confirmed/ 2. Non-confirmed/ 3. Project/ 4. Casual
5. Contact number
6. Hospital number
7. Age in years
8. Date of birth
9. Gender M/F
10. Category
    B. Staff:
       Doctor: 1. Consultant 2. PG superspeciality 3. PG speciality 4. Non-PG 5. Intern
       Nurse: 1. Medical 2. Surgical
       Attender
       Sweeper
    C. Student: 1. MBBS, 2. Nursing, 3. AHS
    D. Others, specify _____
11. No of years work in CMC_____yrs____months
12. No. Of years study in CMC_____yrs____months
13. Department (Currently) in
14. Comorbidity: 1. DM 2.HTN 3.Epilepsy 4. Bronchial Asthma 5.CAD 6. Others 7.None
    If others, specify_____
15. Pre-existing eye morbidities (except prescription glasses) Y/N
    If yes, details_____
16. Wearing prescription glasses? Y/N

DETAILS OF CURRENT INCIDENT

17. Date and time of incident
    __/__/2017 AM/PM
18. Place of incident:_____
19. Date and time of reporting incident to the first point of care
    __/__/2017 AM/PM
20. Date and time of being examined by eye doctor/PI
    __/__/2017 AM/PM
21. Past incidents of eye injury if any at workplace?: Y/N

DESCRIPTION OF THE INCIDENT

22. Hazard: 1. Chemical/ 2. BBF splash/ 3. Blunt trauma/ 4. Sharp/ 5. Foriegn body/ 6. Infectious conjunctivitis/ 7. Others
23. If chemical splash Y/N
    Name of chemical:_____
    Mode of injury:_____
    Protocol followed Y/N
    Classification:
24. If BBF splash Y/N
    Name of fluids: 1.Blood or blood products/ 2. Body fluids/ 3. Other fluids
    Is it splashed into the eye : Y/N/Don't know
    Mode of injury_____
    Protocol followed Y/N (wash in running water for 15 min atleast) Y/N
25. If blunt trauma Y/N
    Mode of injury_____
    Classification _____
26. If sharp injury, Y/N
    Ant segment: conjunctiva, cornea
    Posterior segment:_____
    Mode of injury:_____
    Classification:_____
27. If foreign body, Y/N
    Ant segment: conjunctiva, cornea
    Posterior segment:_____
28. If conjunctivitis, Y/N
    Duration in days:___

History of contact: 1. Workplace/ 2. Family/ 3. Visit to eye hospital (except Schell staff) in past week/ 4. Don't know/ 5. None of the above

29. If others, specify_____

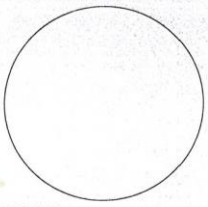
EYE SAFETY EQUIPMENT AND PRACTICES

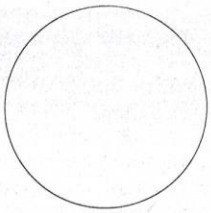
30. Available in the department? Y/N/NA
31. Are they used? Y/N/NA
32. Are they handy? Y/N/NA
33. Do they fit properly? Y/N/NA
34. Did you go through any orientation/ training on PPE use at induction? Y/N/NA
35. PPE if used here: Appropriate/ Inappropriate/NA
    If inappropriate, any remarks_____

FINDINGS

36. Side of eye injury: 1. Right/ 2. Left/ 3. Both/ 4. Don't know
37. Visual Acuity RE:_____/LE_____

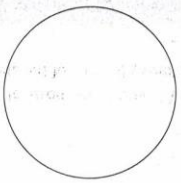
38. ANTERIOR SEGMENT
    LIDS/ ADNEXA
    CONJUNCTIVA AND SCLERA





    CORNEA
    ANT CHAMBER
    IRIS AND PUPIL
    IOP: Applanation/ Tonopen
    LENS

39. POSTERIOR SEGMENT
    VITREOUS
    FUNDUS
    OTHER REMARKS



40. Signs of previous eye injuries? Y/N
41. Diagnosis_____
42. First Aid given? Y/N
43. If yes, what _____
44. Did it require a treatment in eye hospital? Y/N
45. If yes, Medical/Surgical/Both
    Relevant details if any eg IP_____
46. No of days SL__days

47. Follow up required? Y/N
48. Sight threatening? Y/N

Annexure 3. Information sheet- English

Acute work related exposure of eyes of health care workers to hazards in a tertiary care hospital in South India - an observational study

The following information is provided to inform you about this research project and your participation in it. Please read this form carefully and feel free to ask any questions you may have about the study or the information given below. You will be given an opportunity to ask questions, and your questions will be answered. Also, you will be given a copy of this information sheet.

Your participation in this research study is voluntary. You are also free to withdraw from this study at any time after it starts.

Purpose of the study:

Ocular trauma is a worldwide cause of visual morbidity, a significant proportion of which occurs in the workplace. This is largely preventable with the use of protective eyewear and strict compliance.

Studies done on eye injuries among various groups of healthcare workers in the past have yielded findings that call for attention and further research in this direction that would be helpful in getting a comprehensive idea and to plan appropriate preventive measures at various levels of care. Acute occupational eye injuries have been a subject of interest particularly among health care providers. Unfortunately many of these incidents often do not get reported, especially in India, where in most healthcare set ups there exists no proper system or protocol to address these injuries and where almost no education regarding prevention of these is done at any point during the employment of personnel.

At Christian Medical College and Hospital, a tertiary healthcare institution, there exists a central fully functional reporting system for blood and body fluid exposure injuries and a staff and students health facility that handles all reported cases of such injuries. Eye injuries are reported either to the emergency, staff clinic or to the ophthalmology department.

Methods to be followed:

This will be a hospital based prospective descriptive study. All the staff and students of the Christian Medical College Vellore will be part of the study.

Any staff or student (currently on CMC payroll or currently student- between November 2016 to April 2016) who while at the workplace doing his/her job, has an

injury or harmful exposure to either or both eyes, fulfilling the inclusion criteria will be recruited.

The staff/ student will present him/herself to the Staff Students Health Services (SSHS) duty doctor/ Accident and Emergency doctor during working hours and to the CMO, Accident and Emergency department/ Schell casualty after working hours. A regular registration will be made and first aid given at the point of first contact. Subsequently the Principal Investigator (PI) of this study will be informed about this case.

The PI, upon receiving information will arrange to see and examine the patient either at the point of first contact or at the eye hospital. A questionnaire will be administered collecting personal details as well as details of the mode, time and place of injury and other variables. A full clinical ophthalmic examination will be conducted including visual acuity testing by Snellen's chart, pupillary reactions by torch light, intraocular pressure testing by goldmann applanation tonometer or tonopen ,anterior segment examination by using a portable slit lamp/ regular slit lamp and posterior segment examination by indirect ophthalmoscopy with 90 D lens /direct ophthalmoscopy. The extent of injury will be measured by slit lamp and will be classified based on the type of injury, chemical injuries by Roper Hall or Dua's classification, trauma by Occupational Trauma Score and blood and body fluids exposure by Exposure classification of an occupational exposure.Investigations if necessary would be done at the Schell eye hospital and investigations done based on the severity of the injury and clinical findings.

The person will be asked to follow up in the eye hospital OPD once within a week or more times depending upon the severity and mode of injury and frequently if needed as assessed by the principal investigator.

Duration of study:

Six months (February 15th 2017 to August 14th 2017)

Will it cost you any money?

Your will not incur any cost due to participation in the study

Will participating in the study cause discomforts, inconveniences, and / or risk

Nil

Is there any unforeseeable risk?

There are no unforeseeable risks.

Compensation in case of study-related injury:

We do not expect any injury related to this and hence will not be compensating you monetarily.

Anticipated benefits from this study:

An increased awareness about preventive eye care at work, among the staff and students and a better reporting system will be in place

Compensation for participation:

We will not be giving you money to answer questions or be a part of this study

Circumstances under which the principal investigator may withdraw you from the study participation:

If you wish not to answer questions we can withdraw your ward from this study. If you withdraw, this will not stop our providing medical care for you or your family now or any time in future.

What happens if you choose to withdraw from study participation?

The information you give us will be destroyed and will not be used by us.

Confidentiality:

All efforts will be made to keep your personal information in the research record confidential. It will not be shared with anyone else.

Privacy:

Your identity will not be revealed to anyone else; however summary data of the study may be shared with Institutional Review Board of Christian Medical College and used for publication.

Contact information:

If you have any questions about this research study or possibly, please feel free to contact:

Dr. Prathibha Roy. P 0416-2284207

Tamil information sheet

தகவல் படிவம்

மூன்றாம் நிலை மருத்துவமனைகளில் வேலை செய்யும் சுகாதார தொழிலாளர்களுக்கு (ஆஸ்பத்திரி ஊழியர்கள்)

வேலை ஸ்தலங்களில் திடீரென ஏற்படும் கண் சம்மந்தமான விபத்து குறித்த ஆராய்ச்சி

இந்த படிவத்தில் நீங்கள் பங்கேற்கபோகிற ஆராய்ச்சி குறித்து முக்கிய விவரங்களை காண்க.
இதை கவனமாக வாசித்த பிறகு உங்கள் சந்தேகங்களுக்கோ கேள்விகளுக்கோ பதில் கொடுக்கப்படும்.
இந்த படிவமும் உங்களுக்கு கொடுக்கப்படும். இதில் நீங்கள் சொந்த இஷ்டமாக பங்கு பெற வேண்டும்.
இந்த ஆராய்ச்சி ஆரம்பித்த பிறகும் நீங்கள் உங்கள் பங்கேற்பை எப்பொழுதும் நிறுத்திக்கொள்ளலாம்.

ஆராய்ச்சியின் அவசியம்

கண் சம்மந்தமான சரியான அபாய தடுப்பு முறைகளை பயன்படுத்தினால் பொதுவாக விபத்துக்களை தவிர்க்க முடியும்.
சுகாதார தொழிலாளர்களுக்கு தங்கள் வேலை ஸ்தலத்தில் ஏற்படும் கண் சம்மந்தமான விபத்துக்களை குறித்து போதுமான ஆராய்ச்சிகள் இல்லாத குறைவால் இந்த ஆராய்ச்சி மேற்கொள்ளப்படுகிறது.
இவ்விபத்துக்களை தவிர்க்கவும். ஒரு வேளை விபத்து ஏற்பட்டால் அதற்கான சரியான சிகிச்சையை பெற அவசர தொடர்பு கொள்ளவும், ஏற்கனவே இருக்கும், பயன்படுத்தப்படும் தகவல் அறிவிப்பு முறையை இன்னும் சிறப்பாக மேற்கொள்ளவும், முக்கியமாக சி.எம்.சி.மருத்துவனை ஊழியர்களுக்கு இந்த ஆராய்ச்சி மிக உதவியாக இருக்கும்.

ஆராய்ச்சியின் முறை:

சி.எம்.சி.மருத்துவமனையின் தற்போது ஊழியர்கள் மற்றும் தற்போது படித்துக்கொண்டு இருக்கும் மாணவர்கள் இதில் பங்கேற்கலாம். இந்த நபர்களுக்கு வேலை ஸ்தலத்தில் ஏற்படும் கண் சம்மந்தமான விபத்துக்களையும், நோய்களையும் உடனடியாக எஸ்.எஸ்.எச்.எஸ்.(S.S.H.S.) / சி.எம்.சி.கண்மருத்துவனை / சி.எம்.சி.அவசர பிரிவு மற்றும் சாட், சூசா போன்ற கிளைப்பிரிவுகளுக்கு தெரிவித்த பிறகு அவர்கள் அங்கேயே பதிவு செய்து முதலுதவி பெற்றுக்கொண்ட பிறகு இந்த ஆராய்ச்சியின் முக்கிய ஆராய்சியாளருக்கு தகவல் கொடுக்கப்படும். அவசியப்பட்டால் கண் ஆஸ்பத்திரிக்கு மேல் உதவிக்காக அனுப்பப்பட இயலலாம். அல்லது முக்கிய ஆராய்சியாளர் அங்கேயே வந்து உங்களை பார்த்து உங்கள் அனுமதியோடு சிகிச்சை அளித்த பிறகு ஆய்வுக்கான படிவத்தை நிரப்புவார்கள். தேவைப்பட்டால் மறுநாள்திப்பிற்கு கண் ஆஸ்பத்திரிக்கு ஒரு வாரத்திற்குள்ளாக ஒரு முறையோ பல முறையோ நீங்கள் அழைக்கப்படலாம்.
முக்கிய ஆராய்சியாளர் உங்கள் கண்களை முழு பரிசோதனை செய்வார் அதற்காக பார்வையின் அளவு, கண்களுக்குள் உள்ள அழுத்தம் மற்றும் இது போன்ற தேவையான பரிசோதனையை அவசியப்பட்டால் மேற்கொள்ளலாம். உங்களிடத்தில் சில கேள்விகளையும் கேட்டு படிவத்தில் நிரப்புவார்கள். நீங்கள் கொடுக்கும் தகவல்கள் எல்லாம் முழு ரகசியமாக வைக்கப்படும்.

ஆராய்சியின் காலம்:
டிசம்பர் 2016 முதல் மே 2017 வரை

1. உங்களுக்கு இதில் பண செலவு உண்டா?- இல்லை
2. ஆராய்சியில் பங்கு பெறுவதால் எந்த ஆபத்து அல்லது பயப்படவேண்டிய அபாயமான சந்தர்ப்பங்கள் ஏற்படலாமா? -இல்லை
3. எதிர்பார்க்காத ஆபத்தான சூழ்நிலைகள் இந்த ஆராய்சியில் ஏற்பட வாய்ப்பு உண்டா? -இல்லை
4. இதில் பங்குப்பெறுவதின் மூலம் ஒரு வேளை இதற்கு சம்மந்தமான விபத்து ஏற்பட்டால் ஏதாவது பண உதவி உண்டா? -இல்லை
5. இதில் பங்குப்பெற்றால் ஏதாவது நன்மை உண்டா? – பண உதவி இல்லை, ஆனால் உங்கள் கண் பாதுகாப்பு குறித்த அல்லது நோய் தடுப்பு குறித்த முக்கிய தகவல்களை நீங்கள் அறிந்து கொள்ளலாம்.
6. பங்குப்பெறுவதற்கு அன்பளிப்பு கொடுக்கப்படுமா? -இல்லை.
7. எந்த சூழ்நிலைகளில் முக்கிய ஆராய்சியாளர் இந்த ஆராய்சியிலிருந்து உங்கள் பங்கேற்பை நிறுத்த முடியும்?
   ஆராய்சியாளர் உங்களை அணுகி கேட்கும் படிவத்தில் இருக்கும் கேள்விகளுக்கு பதில் கொடுக்க மறுத்தாலோ கண் பரிசோதனை மற்றும் சிகிச்சை பெற மறுத்தாலோ நீங்கள் இந்த ஆராய்சியில் இருந்து வெளியேற்றப்படுவீர்கள்.
8. ஆராய்சியில் இருந்து வெளியேறும் சந்தர்ப்பத்தில் நான் அளித்த விபரங்களை என்ன செய்வீர்கள்?
   அவைகளை அழித்து போடுவது எங்கள் பொறுப்பு. அதை நாங்களும் பயன்படுத்த முடியாது.
   ஆராய்சியின் ரகசிய தன்மை நீங்கள் கொடுக்கும் தகவல்கள் யாரோடும் பகிர்ந்து கொள்ளப்படாது.
9. தனியுரிமை கொள்கை:உங்களுடைய தனிப்பட்ட தனித்துவம் எவரோடும் பகிர்ந்து கொள்ளப்படாது.

ஆராய்சியை குறித்த கேள்விகளுக்கு தொடர்பு கொள்ள
டாக்டர்.பிரதீபா ராய். ப. 0416 2281201

Annexure 3- Informed consent English and Tamil

Informed Consent Form for participants

Study Title: Acute work related exposure of eyes of health care workers to hazards in a tertiary care hospital in South India - an observational study

Study Number: _____

Subject's Initials: _____Subject's Name: _____

Date of Birth / Age: _____

(i) I confirm that I have read and understood the information sheet dated _____ for the above study and have had the opportunity to ask questions. [ ]

(ii) I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. [ ]

(iii) I understand that ***the Sponsor of the clinical trial, others working on the Sponsor's behalf (delete as appropriate)***, the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published. [ ]

(iv) I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s). [ ]

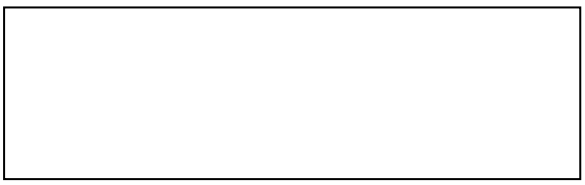
(v) I agree to take part in the above study. [ ]

Signature (or Thumb impression) of the Subject/Legally Acceptable

Date: _____/_____/_____

Signatory's Name: _____ Signature:

Or



Representative: _____

Date: _____/_____/_____

Signatory's Name: _____

Signature of the Investigator: _____

Date: _____/_____/_____

Study Investigator's Name: _____

Signature or thumb impression of the Witness: _____

Date: _____/_____/_____

Name & Address of the Witness: _____

Tamil consent forms

ஒப்புதல் படிவம்

மூன்றாம் நிலை மருத்துவமனைகளில் வேலை செய்யும் சுகாதார தொழிலாளர்களுக்கு (ஆஸ்பத்திரி ஊழியர்கள்)

வேலை ஸ்தலங்களில் திடீரென ஏற்படும் கண் சம்மந்தமான விபத்து குறித்த ஆராய்ச்சி

படிவம் எண்: தேதி

பங்கேற்பவர்களின் பெயர்: பிரிவு:

கணவன்/பெற்றோர்/காப்பாளர் பெயர்:

1. இந்த ஆராய்ச்சிக்கான தகவல் படிவம் எனக்கு வாசிக்கப்பட்டது / நான் வாசித்தேன். அதை குறித்து கேள்விகளை கேட்க எனக்கு வாய்ப்பு அளிக்கப்பட்டது.
2. இதில் நான் தன்னார்வத்துடன் பங்கேற்கிறேன் என்றும் இப்போது அல்லது பிறகு நான் பங்கேற்க மறுத்தால் எந்த விதத்திலேயும் மருத்துவ உதவி எனக்கோ என் குடுபத்திற்கோ மறுக்கப்படாது என்று தெரிந்து கொண்டேன்.
3. என்னுடைய பெயர் முகவரி மற்றும் நான் அளிக்கும் மற்ற விவரங்களை ஆராய்ச்சியாளர்கள் மற்ற யாருக்கும் வெளியிட மாட்டார்கள் என்பது தெரிந்து கொண்டேன்.
4. என் விபரங்களை இந்த ஆராய்ச்சியில் இருந்து இதற்கு சம்மந்தமான கிளை ஆராய்ச்சிகளில் உபயோகிக்க நான் மறுக்கவில்லை.
5. என்னை கேள்விக்கேட்கவும், என்னை வந்து சந்திக்கவும், ஆராய்ச்சி சம்மந்தமான மற்ற எந்த விவரங்களை கேட்கவும், சிகிச்சை அவசியப்பட்டால் அதை எனக்கு அளிக்கவும் அனுமதி கொடுக்கிறேன். நான் இந்த ஆராய்ச்சியில் பங்கேற்க விரும்புகிறேன்.

பெயர்:_____

கையொப்பம்:_____(அ) [ ] வலதுகை

தேதி:_____

சாட்சி பெயர்:_____(அ) [ ] வலதுகை

கையொப்பம்:_____

தேதி:

ஆராய்ச்சியாளரின் பெயர்:_____

கையொப்பம்:_____

தேதி:

Tamil

ஒப்புதல் படிவம்

மூன்றாம் நிலை மருத்துவமனைகளில் வேலை செய்யும் சுகாதார தொழிலாளர்களுக்கு (ஆஸ்பத்திரி ஊழியர்கள்)

வேலை ஸ்தலங்களில் திடீரென ஏற்படும் கண் சம்மந்தமான விபத்து குறித்த ஆராய்ச்சி

படிவம் எண்: நேதி

பங்கேற்பவர்களின் பெயர்: பிரிவு

கணவன்/பெற்றோர்/காப்பாளர் பெயர்:

1. இந்த ஆராய்ச்சிக்கான தகவல் படிவம் எனக்கு வாசிக்கப்பட்டது / நான் வாசித்தேன். அதை குறித்து கேள்விகளை கேட்க எனக்கு வாய்ப்பு அளிக்கப்பட்டது.
2. இதில் நான் தன்னார்வத்துடன் பங்கேற்கிறேன் என்றும் இப்போது அல்லது பிறகு நான் பங்கேற்க மறுத்தால் எந்த விதத்திலேயும் மருத்துவ உதவி எனக்கோ என் குடும்பத்திற்கோ மறுக்கப்படாது என்று தெரிந்து கொண்டேன்.
3. என்னுடைய பெயர் முகவரி மற்றும் நான் அளிக்கும் மற்ற விவரங்களை ஆராய்சியாளர்கள் மற்ற யாருக்கும் வெளியிட மாட்டார்கள் என்பது தெரிந்து கொண்டேன்.
4. என் விபரங்களை இந்த ஆராய்சியில் இருந்து இதற்கு சம்மந்தமான கிளை ஆராய்ச்சிகளில் உபயோகிக்க நான் மறுக்கவில்லை.
5. என்னை கேள்விக்கேட்கவும், என்னை வந்து சந்திக்கவும், ஆராய்ச்சி சம்மந்தமான மற்ற எந்த விவரங்களை கேட்கவும், சிகிச்சை அவசியப்பட்டால் அதை எனக்கு அளிக்கவும் அனுமதி கொடுக்கிறேன். நான் இந்த ஆராய்சியில் பங்கேற்க விரும்புகிறேன்.

பெயர்:

கையொப்பம்: (அ) [ ]
வலது

நேதி:

சாட்சி பெயர்: (அ) [ ]
வலது

கையொப்பம்:

நேதி:

ஆராய்சியாளரின் பெயர்:

கையொப்பம்:

நேதி:

Annexure-5 IRB clearance

OFFICE OF RESEARCH
INSTITUTIONAL REVIEW BOARD (IRB)
CHRISTIAN MEDICAL COLLEGE, VELLORE, INDIA

Dr. B.J. Prashantham, M.A., M.A., D. Min (Clinical)
Director, Christian Counseling Center,
Chairperson, Ethics Committee.

Dr. Anna Benjamin Pulimood, M.B.B.S., MD., Ph.D.,
Chairperson, Research Committee & Principal

Dr. Biju George, M.B.B.S., MD., DM.,
Deputy Chairperson,
Secretary, Ethics Committee, IRB
Additional Vice-Principal (Research)

December 13, 2016

Dr. Prathibha Roy,
PG Registrar,
Department of Ophthalmology,
Christian Medical College,
Vellore - 632 004.

Sub: **Fluid Research Grant NEW PROPOSAL:**
Acute occupation (work) related eye injury among healthcare personnel in a tertiary hospital - (WREI) A descriptive study.
Prathibha Roy. P, Employment Number: 33809, PG Registrar, Ophthalmology, Dr. Padma Paul,Employment Number: 14374, Ophthalmology, Dr. Anika Amritanand, Ophthalmology, Employment Number: 32301, Dr. Henry Kirupakaran, Employment Number: 50534, SSHS, Dr Regina d Alex, Employment Number: 30968, Accident and Emergency, Dr. Obed John Heber Antipas, Employment Number: 53528 SSHS.

Ref: IRB Min No: 10358 [OBSERVE] dated 03.11.2016

Dear Dr. Prathibha Roy,

I enclose the following documents:-

1. Institutional Review Board approval 2. Agreement

Could you please sign the agreement and send it to Dr. Biju George, Addl. Vice Principal (Research), so that the grant money can be released.

With best wishes,

Dr. Biju George
Secretary (Ethics Committee)
Institutional Review Board

Dr. BIJU GEORGE
MBBS., MD., DM.
SECRETARY - (ETHICS COMMITTEE)
Institutional Review Board,
Christian Medical College, Vellore - 632 002.

Cc: Dr. Padma Paul, Dept. of Ophthalmology, CMC, Vellore

Ethics Committee Blue, Office of Research, 1st Floor, Carman Block, Christian Medical College, Vellore, Tamil Nadu 632 002
Tel: 0416 – 2284294, 2284202 Fax: 0416 – 2262788, 2284481 E-mail: research@cmcvellore.ac.in

OFFICE OF RESEARCH
INSTITUTIONAL REVIEW BOARD (IRB)
CHRISTIAN MEDICAL COLLEGE, VELLORE, INDIA

Dr. B.J. Prashantham, M.A., M.A., Dr. Min (Clinical)
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Ref: IRB Min No: 10358 [OBSERVE] dated 03.11.2016

Dear Dr. Prathibha Roy,

The Institutional Review Board (Blue, Research and Ethics Committee) of the Christian Medical College, Vellore, reviewed and discussed your project titled "Acute occupation (work) related eye injury among healthcare personnel in a tertiary hospital - (WREI) A descriptive study" on November 03rd 2016.

The Committee reviewed the following documents:

1. IRB Application format
2. Proforma
3. Information Sheet and Informed Consent Form (English and Tamil)
4. Cvs of Drs. Prathibha Roy, . Padma Paul, Anika Amritanand, Henry Kirupakaran, Reginald Alex, Obed John Heber Antipas
5. No. of documents 1- 4

The following Institutional Review Board (Blue, Research & Ethics Committee) members were present at the meeting held on November 03rd 2016 in the BRTC Conference Room, Christian Medical College, Bagayam, Vellore 632002.

2 of 4

Dr. B.J. Prashantham, M.A., M.A., Dr. Min (Clinical)
Director, Christian Counseling Center,
Chairperson, Ethics Committee.

Dr. Anna Benjamin Pulimood, M.B.B.S., MD., Ph.D.,
Chairperson, Research Committee & Principal

Dr. Biju George, M.B.B.S., MD., DM.,
Deputy Chairperson,
Secretary, Ethics Committee, IRB
Additional Vice-Principal (Research)

Name	Qualification	Designation	Affiliation
Dr. Biju George	MBBS, MD, DM	Professor, Haematology, Research), Additional Vice Principal , Deputy Chairperson (Research Committee), Member Secretary (Ethics Committee), IRB, CMC,Vellore	Internal, Clinician
Dr. B. J. Prashantham	MA(Counseling Psychology), MA (Theology), Dr. Min (Clinical Counselling)	Chairperson, Ethics Committee, IRB. Director, Christian Counseling Centre, Vellore	External, Social Scientist
Dr. Ratna Prabha	MBBS, MD (Pharma)	Associate Professor, Clinical Pharmacology, CMC, Vellore	Internal, Pharmacologist
Dr. Rekha Pai	BSc, MSc, PhD	Associate Professor, Pathology, CMC, Vellore	Internal,Basic Medical Scientist
Rev. Joseph Devaraj	BSc, BD	Chaplaincy Department, CMC, Vellore	Internal, Social Scientist
Mr. C. Sampath	BSc, BL	Advocate, Vellore	External, Legal Expert
Dr. Ranjith K Moorthy	MBBS, MCh	Professor, Neurological Sciences, CMC, Vellore	Internal, Clinician
Mrs. Sheela Durai	MSc Nursing	Professor, Medical Surgical Nursing, CMC, Vellore	Internal, Nurse
Ms. Grace Rebekha	M.Sc., (Biostatistics)	Lecturer, Biostatistics, CMC, Vellore	Internal, Statistician
Mrs. Pattabiraman	BSc, DSSA	Social Worker, Vellore	External, Lay Person
Dr. Anand Zachariah	MBBS, PhD	Professor, Medicine, CMC, Vellore	Internal, Clinician
Dr. Balamugesh	MBBS, MD(Int Med), DM, FCCP (USA)	Professor, Pulmonary Medicine, CMC, Vellore	Internal, Clinician

Ethics Committee Blue, Office of Research, 1st Floor, Carman Block, Christian Medical College, Vellore, Tamil Nadu 632 002
Tel: 0416 – 2284294, 2284202 Fax: 0416 – 2262788, 2284481 E-mail: research@cmcvellore.ac.in

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Chairperson, Research Committee & Principal

Dr. Biju George, M.B.B.S., MD., DM.,
Deputy Chairperson,
Secretary, Ethics Committee, IRB
Additional Vice-Principal (Research)

Dr. Sneha Varkki	MBBS, DCH, DNB	Professor, Paediatrics, CMC, Vellore	Internal, Clinician
Mrs. Emily Daniel	MSc Nursing	Professor, Medical Surgical Nursing, CMC, Vellore	Internal, Nurse
Dr. Sathish Kumar	MBBS, MD, DCH	Professor, Child Health, CMC, Vellore	Internal, Clinician
Dr. Visalakshi. J	MPH, PhD	Lecturer, Biostatistics, CMC, Vellore	Internal, Statistician
Dr. Mathew Joseph	MBBS, MCH	Professor, Neurosurgery, CMC, Vellore	Internal, Clinician

We approve the project to be conducted as presented.

Kindly provide the total number of patients enrolled in your study and the total number of withdrawals for the study entitled: "Acute occupation (work) related eye injury among healthcare personnel in a tertiary hospital - (WREI) A descriptive study" on a monthly basis.
Please send copies of this to the Research Office (research@cmcvellore.ac.in).

Fluid Grant Allocation:

A sum of 50,000/- INR (Rupees Fifty Thousand Only) will be granted for 6 months.

Yours sincerely,

Dr. Biju George
Secretary (Ethics Committee)
Institutional Review Board

Dr. BIJU GEORGE
MBBS., MD., DM.
SECRETARY - (ETHICS COMMITTEE)
Institutional Review Board,
Christian Medical College, Vellore - 632 002.

IRB Min No: 10358 [OBSERVE] dated 03.11.2016

CHRISTIAN MEDICAL COLLEGE, VELLORE
AGREEMENT TO BE SIGNED BEFORE RELEASE OF ANY RESEARCH GRANT
*****

1. I understand that the research grant is sanctioned only for the specific project approved by the Institutional Review Board and should be used exclusively for this project

2. I note that the project will become operational with effect from the date on which the grant is received, and I agree to complete it within the stipulated time of 6 months.

3. I agree to submit promptly and regularly, the periodical (Half Yearly for One Year Project/Annually for Two years project) reports and the final report of the work done, in the approved format.

4. If I plan to leave the institution on before the completion of the project. I will submit a complete and detailed report of the work done by me on the project till the date of relief and transfer the project, either to the Guide or to the Co-Investigator for completion and submission of the Final Report.

5. I agree that any publication arising out of this project will carry an acknowledgement of the financial support of the Christian Medical College Fluid Research Fund.

Fluid Grant Allocation:

A sum of 50,000/- INR (Rupees Fifty Thousand Only) will be granted for 6 months.

PRINCIPAL

Dr. BIJU GEORGE
MBBS., MD., DM.
SECRETARY - (ETHICS COMMITTEE)
Institutional Review Board,
Christian Medical College, Vellore - 632 002.

Prathibha Roy.P.
Dr. Prathibha Roy,
Ophthalmology.

Dr. Padma Paul,
Ophthalmology.

Project Title: Acute occupation (work) related eye injury among healthcare personnel in a tertiary hospital - (WREI) A descriptive study.

Ref: IRB Min No: 10358 [OBSERVE] dated 03.11.2016.

For IRB approval

Date: 15.10.2016

OFFICE OF THE MEDICAL SUPERINTENDENT
No. 99
15 OCT 2016
C.M.C., VELLORE-632004

To,

The Medical Superintendent,
CMCH, Vellore

Dear Sir,

This is to request your permission to conduct this observational study on the staff and students of CMCH Vellore as discussed with you. The Principal Investigator is Dr Pratibha Roy and I shall be her guide for the purpose of this study. The co-investigators will be Dr Anika Amritanand from Ophthalmology, Dr Reginald Alex from accident and emergency, Drs Henry Kirubakaran and Obed from SSHS.

The hope is that we will get an idea regarding the incidence of acute occupational exposure of the eyes of staff and students to blunt trauma or exposure to hazardous chemicals, blood and body fluids, foreign bodies, sharps etc. and injuries from them with a view to set up safety measures, reporting and treatment protocols and finally increasing awareness regarding eye safety among all at risk for such exposure. This will go a long way in the safety of our staff and students.

We look forward to your permission and encouragement in this endeavour.

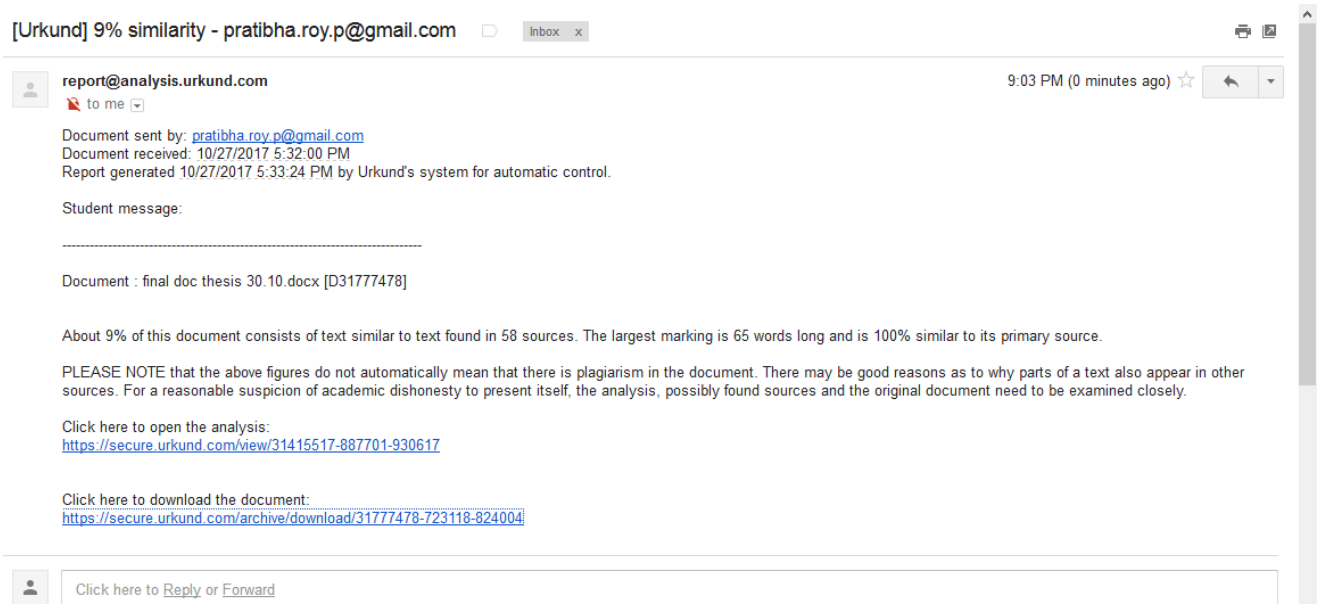
With regards

Dr Padma Paul
Associate Professor,
Ophthalmology, CMC, Vellore – 632001.

18/10/16
Permitted.
Needs IRB approval

Medical Superintendent
Christian Medical College
VELLORE - 632 004.

Antiplagiarism report



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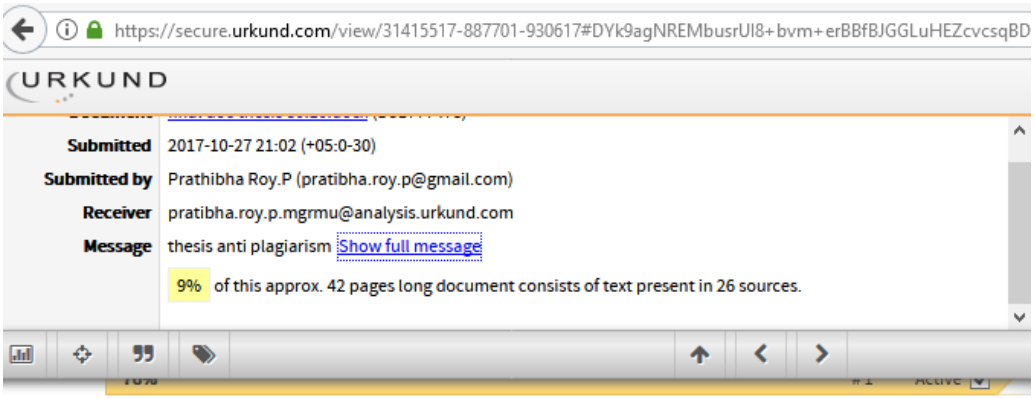

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Submitted	2017-10-27 21:02 (+05:0-30)
Submitted by	Prathibha Roy.P (pratibha.roy.p@gmail.com)
Receiver	pratibha.roy.p.mgrmu@analysis.urkund.com
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Conclusions ---------- 8. Limitations ---------- 9. Recommendations ---------- 10. Bibliography ---------- 11. Annexures

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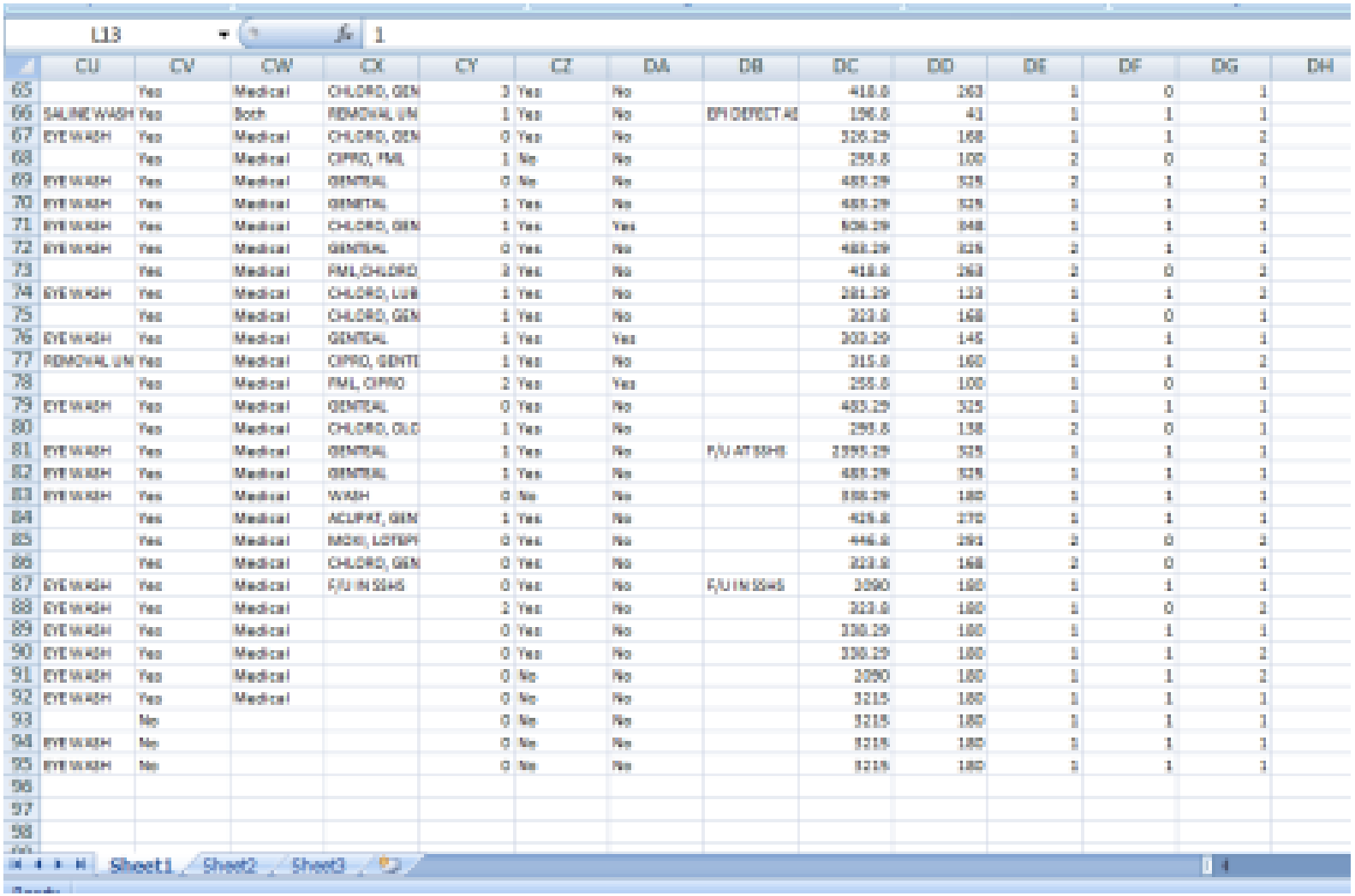
1.

Introduction Occupational hazards to personnel in most industries are well documented and studied in the past (1–3). The health care industry is not immune to this by any means. As per the Census done in 2001, the Indian workforce numbered over 400 million, constituting 39.1 % of the total population of the country. Of this in 2015, Indian healthcare sector became the fifth largest employer, both in terms of direct as well as indirect employment, with an estimated total direct employment of 4,713,061 people (4) The healthcare industry globally has been growing at unprecedented rates in the last few decades with countries like India taking a lead position and even becoming a hub of medical tourism (4). This expansion of health care industry with the rapid addition of paramedical workforce organised and unorganised, trained and untrained, to bolster the shortfall in terms of trained doctors and nurses often happens at a pace that precludes evaluation of existing occupational health policies and practices for employees. Added to this is the growing demand and prohibitive costs for health care which pushes employees to work in sometimes less than ideal working conditions eg work for longer hours than recommended for safety. Our institution is a tertiary care institution which is well over 100 years old and has seen such a growth from its early humble beginnings of less than a 100 employees to nearly 10000 currently. To recognise the importance of the health of its employees in general, a dedicated Staff Student Health Services has been operational now for more than 50 years. It was only in the year 2010 that an institution wide effort was made to look at all the safety aspects for patients and employees. Not surprisingly, several shortfalls were identified and addressed so much so that we were accredited by the National Accreditation Board for Hospitals and healthcare providers (NABH) in December 2013. It was alongside this that the institution put together an Occupational Health team under the leadership of a trained



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	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF	DG	DH
65		Yes	Medical	CHLORO, GEN	3	Yes	No		418.6	263	1	0	1	
66	SALINE WASH	Yes	Both	REMOVAL UN	1	Yes	No	BPI DEFECT AS	196.6	41	1	1	1	
67	EYE WASH	Yes	Medical	CHLORO, GEN	0	Yes	No		326.29	168	1	1	2	
68		Yes	Medical	CIPRO, FML	1	No	No		255.6	100	2	0	2	
69	EYE WASH	Yes	Medical	GENTEAL	0	No	No		485.29	325	2	1	1	
70	EYE WASH	Yes	Medical	GENTAL	1	Yes	No		485.29	325	1	1	2	
71	EYE WASH	Yes	Medical	CHLORO, GEN	1	Yes	Yes		506.29	348	1	1	1	
72	EYE WASH	Yes	Medical	GENTEAL	0	Yes	No		485.29	325	1	1	1	
73		Yes	Medical	FML,CHLORO	3	Yes	No		418.6	263	1	0	1	
74	EYE WASH	Yes	Medical	CHLORO, LUB	1	Yes	No		281.29	133	1	1	1	
75		Yes	Medical	CHLORO, GEN	1	Yes	No		323.6	168	1	0	1	
76	EYE WASH	Yes	Medical	GENTEAL	1	Yes	Yes		302.29	145	1	1	1	
77	REMOVAL UN	Yes	Medical	CIPRO, GENTE	1	Yes	No		315.6	160	1	1	2	
78		Yes	Medical	FML, CIPRO	2	Yes	Yes		255.6	100	1	0	1	
79	EYE WASH	Yes	Medical	GENTEAL	0	Yes	No		485.29	325	1	1	1	
80		Yes	Medical	CHLORO, OLO	1	Yes	No		293.6	138	2	0	1	
81	EYE WASH	Yes	Medical	GENTEAL	1	Yes	No	F/U AT SSHS	2395.29	325	1	1	1	
82	EYE WASH	Yes	Medical	GENTEAL	1	Yes	No		485.29	325	1	1	1	
83	EYE WASH	Yes	Medical	WASH	0	No	No		888.29	180	1	1	1	
84		Yes	Medical	ACUPAT, GEN	1	Yes	No		426.6	270	1	1	1	
85		Yes	Medical	MOXI, LOTEPI	0	Yes	No		446.6	293	2	0	2	
86		Yes	Medical	CHLORO, GEN	0	Yes	No		323.6	168	2	0	1	
87	EYE WASH	Yes	Medical	F/U IN SSHS	0	Yes	No	F/U IN SSHS	3090	180	1	1	1	
88	EYE WASH	Yes	Medical		2	Yes	No		323.6	180	1	0	1	
89	EYE WASH	Yes	Medical		0	Yes	No		330.29	180	1	1	1	
90	EYE WASH	Yes	Medical		0	Yes	No		330.29	180	1	1	2	
91	EYE WASH	Yes	Medical		0	No	No		3090	180	1	1	2	
92	EYE WASH	Yes	Medical		0	No	No		3215	180	1	1	1	
93		No			0	No	No		3215	180	1	1	1	
94	EYE WASH	No			0	No	No		3215	180	1	1	1	
95	EYE WASH	No			0	No	No		3215	180	1	1	1	
96														
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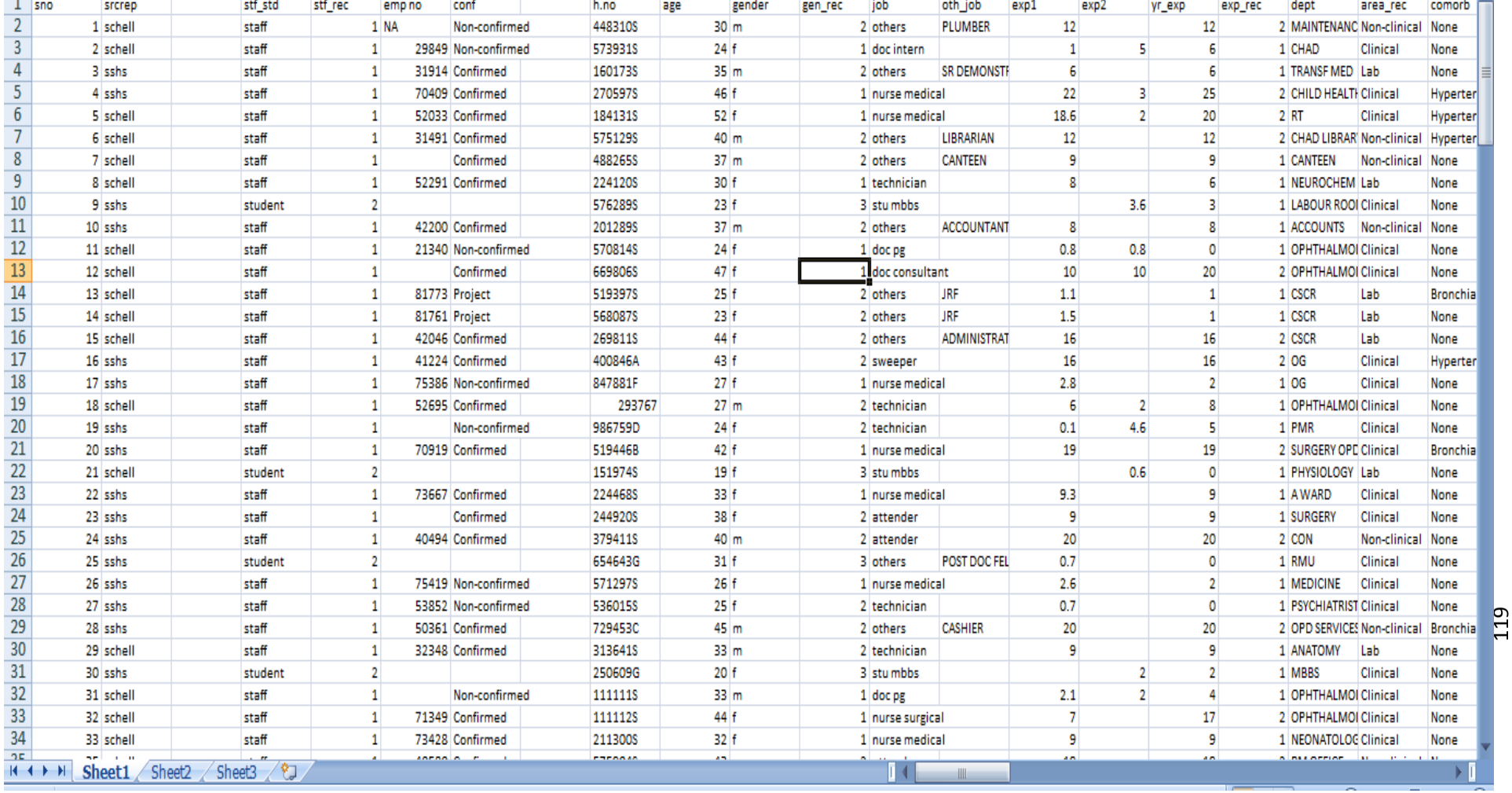
Sheet1 Sheet2 Sheet3



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1	1	schell		staff	1	NA	Non-confirmed	448310S	30	m	2	others	PLUMBER	12		12	2	MAINTENANC	Non-clinical	None
2	2	schell		staff	1	29849	Non-confirmed	573931S	24	f	1	doc intern		1	5	6	1	CHAD	Clinical	None
3	3	sshs		staff	1	31914	Confirmed	160173S	35	m	2	others	SR DEMONSTF	6		6	1	TRANSF MED	Lab	None
4	4	sshs		staff	1	70409	Confirmed	270597S	46	f	1	nurse medical		22	3	25	2	CHILD HEALTH	Clinical	Hyperter
5	5	schell		staff	1	52033	Confirmed	184131S	52	f	1	nurse medical		18.6	2	20	2	RT	Clinical	Hyperter
6	6	schell		staff	1	31491	Confirmed	575129S	40	m	2	others	LIBRARIAN	12		12	2	CHAD LIBRAR	Non-clinical	Hyperter
7	7	schell		staff	1		Confirmed	488265S	37	m	2	others	CANTEEN	9		9	1	CANTEEN	Non-clinical	None
8	8	schell		staff	1	52291	Confirmed	224120S	30	f	1	technician		8		6	1	NEUROCHEM	Lab	None
9	9	sshs		student	2			576289S	23	f	3	stu mbbs			3.6	3	1	LABOUR ROOI	Clinical	None
10	10	sshs		staff	1	42200	Confirmed	201289S	37	m	2	others	ACCOUNTANT	8		8	1	ACCOUNTS	Non-clinical	None
11	11	schell		staff	1	21340	Non-confirmed	570814S	24	f	1	doc pg		0.8	0.8	0	1	OPHTHALMOI	Clinical	None
12	12	schell		staff	1		Confirmed	669806S	47	f	1	doc consultant		10	10	20	2	OPHTHALMOI	Clinical	None
13	13	schell		staff	1	81773	Project	519397S	25	f	2	others	JRF	1.1		1	1	CSCR	Lab	Bronchia
14	14	schell		staff	1	81761	Project	568087S	23	f	2	others	JRF	1.5		1	1	CSCR	Lab	None
15	15	schell		staff	1	42046	Confirmed	269811S	44	f	2	others	ADMINISTRAT	16		16	2	CSCR	Lab	None
16	16	sshs		staff	1	41224	Confirmed	400846A	43	f	2	sweeper		16		16	2	OG	Clinical	Hyperter
17	17	sshs		staff	1	75386	Non-confirmed	847881F	27	f	1	nurse medical		2.8		2	1	OG	Clinical	None
18	18	schell		staff	1	52695	Confirmed	293767	27	m	2	technician		6	2	8	1	OPHTHALMOI	Clinical	None
19	19	sshs		staff	1		Non-confirmed	986759D	24	f	2	technician		0.1	4.6	5	1	PMR	Clinical	None
20	20	sshs		staff	1	70919	Confirmed	519446B	42	f	1	nurse medical		19		19	2	SURGERY OPD	Clinical	Bronchia
21	21	schell		student	2			151974S	19	f	3	stu mbbs			0.6	0	1	PHYSIOLOGY	Lab	None
22	22	sshs		staff	1	73667	Confirmed	224468S	33	f	1	nurse medical		9.3		9	1	A WARD	Clinical	None
23	23	sshs		staff	1		Confirmed	244920S	38	f	2	attender		9		9	1	SURGERY	Clinical	None
24	24	sshs		staff	1	40494	Confirmed	379411S	40	m	2	attender		20		20	2	CON	Non-clinical	None
25	25	sshs		student	2			654643G	31	f	3	others	POST DOC FEL	0.7		0	1	RMU	Clinical	None
26	26	sshs		staff	1	75419	Non-confirmed	571297S	26	f	1	nurse medical		2.6		2	1	MEDICINE	Clinical	None
27	27	sshs		staff	1	53852	Non-confirmed	536015S	25	f	2	technician		0.7		0	1	PSYCHIATRIST	Clinical	None
28	28	sshs		staff	1	50361	Confirmed	729453C	45	m	2	others	CASHIER	20		20	2	OPD SERVICES	Non-clinical	Bronchia
29	29	schell		staff	1	32348	Confirmed	313641S	33	m	2	technician		9		9	1	ANATOMY	Lab	None
30	30	sshs		student	2			250609G	20	f	3	stu mbbs			2	2	1	MBBS	Clinical	None
31	31	schell		staff	1		Non-confirmed	111111S	33	m	1	doc pg		2.1	2	4	1	OPHTHALMOI	Clinical	None
32	32	schell		staff	1	71349	Confirmed	111112S	44	f	1	nurse surgical		7		17	2	OPHTHALMOI	Clinical	None
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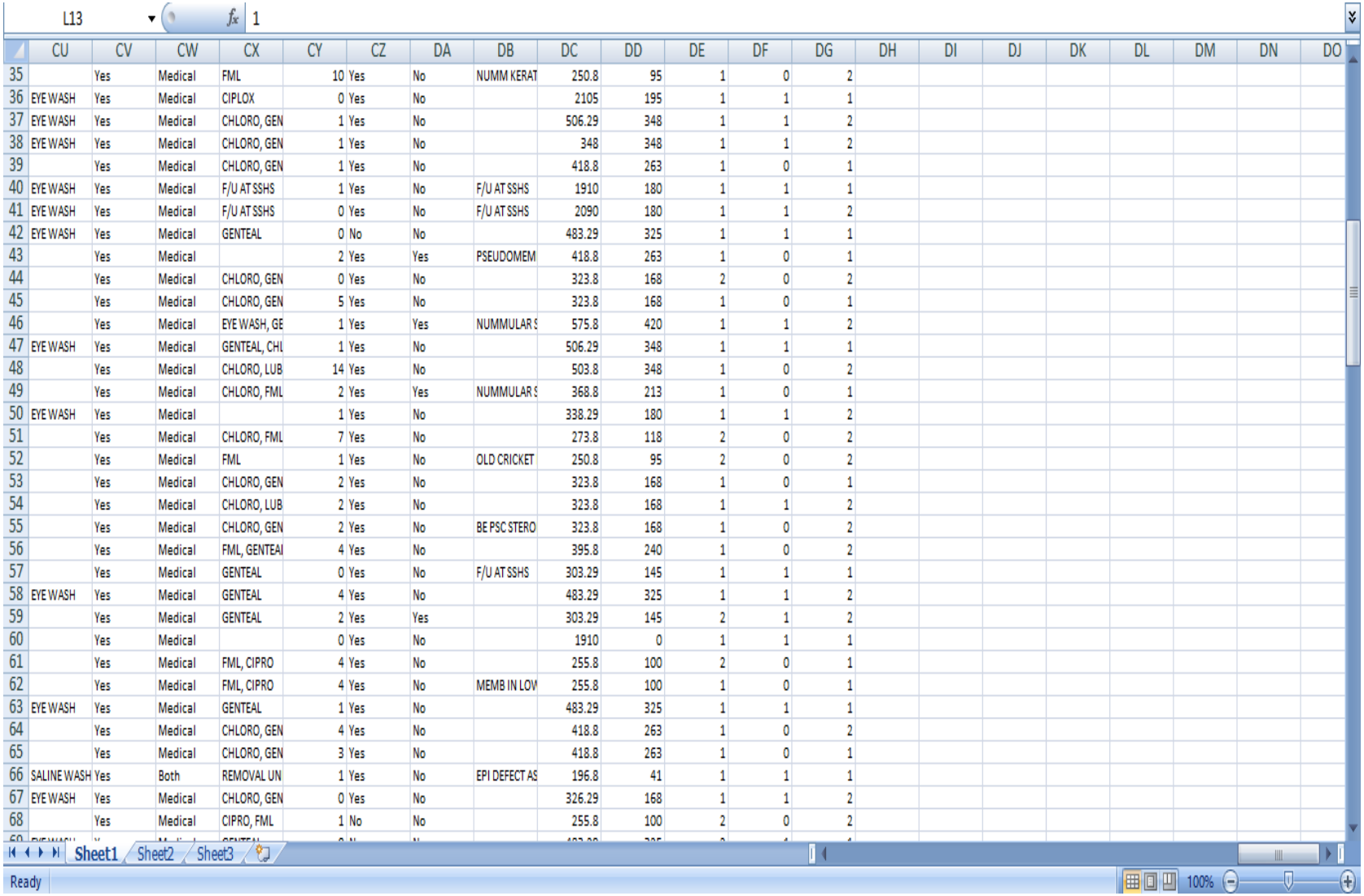

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36	EYE WASH	Yes	Medical	CIPLOX	0	Yes	No		2105	195	1	1	1								
37	EYE WASH	Yes	Medical	CHLORO, GEN	1	Yes	No		506.29	348	1	1	2								
38	EYE WASH	Yes	Medical	CHLORO, GEN	1	Yes	No		348	348	1	1	2								
39		Yes	Medical	CHLORO, GEN	1	Yes	No		418.8	263	1	0	1								
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43		Yes	Medical		2	Yes	Yes	PSEUDOMEM	418.8	263	1	0	1								
44		Yes	Medical	CHLORO, GEN	0	Yes	No		323.8	168	2	0	2								
45		Yes	Medical	CHLORO, GEN	5	Yes	No		323.8	168	1	0	1								
46		Yes	Medical	EYE WASH, GE	1	Yes	Yes	NUMMULAR S	575.8	420	1	1	2								
47	EYE WASH	Yes	Medical	GENTEAL, CHL	1	Yes	No		506.29	348	1	1	1								
48		Yes	Medical	CHLORO, LUB	14	Yes	No		503.8	348	1	0	2								
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50	EYE WASH	Yes	Medical		1	Yes	No		338.29	180	1	1	2								
51		Yes	Medical	CHLORO, FML	7	Yes	No		273.8	118	2	0	2								
52		Yes	Medical	FML	1	Yes	No	OLD CRICKET	250.8	95	2	0	2								
53		Yes	Medical	CHLORO, GEN	2	Yes	No		323.8	168	1	0	1								
54		Yes	Medical	CHLORO, LUB	2	Yes	No		323.8	168	1	1	2								
55		Yes	Medical	CHLORO, GEN	2	Yes	No	BE PSC STERO	323.8	168	1	0	2								
56		Yes	Medical	FML, GENTEAI	4	Yes	No		395.8	240	1	0	2								
57		Yes	Medical	GENTEAL	0	Yes	No	F/U AT SSHS	303.29	145	1	1	1								
58	EYE WASH	Yes	Medical	GENTEAL	4	Yes	No		483.29	325	1	1	2								
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60		Yes	Medical		0	Yes	No		1910	0	1	1	1								
61		Yes	Medical	FML, CIPRO	4	Yes	No		255.8	100	2	0	1								
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63	EYE WASH	Yes	Medical	GENTEAL	1	Yes	No		483.29	325	1	1	1								
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65		Yes	Medical	CHLORO, GEN	3	Yes	No		418.8	263	1	0	1								
66	SALINE WASH	Yes	Both	REMOVAL UN	1	Yes	No	EPI DEFECT AS	196.8	41	1	1	1								
67	EYE WASH	Yes	Medical	CHLORO, GEN	0	Yes	No		326.29	168	1	1	2								
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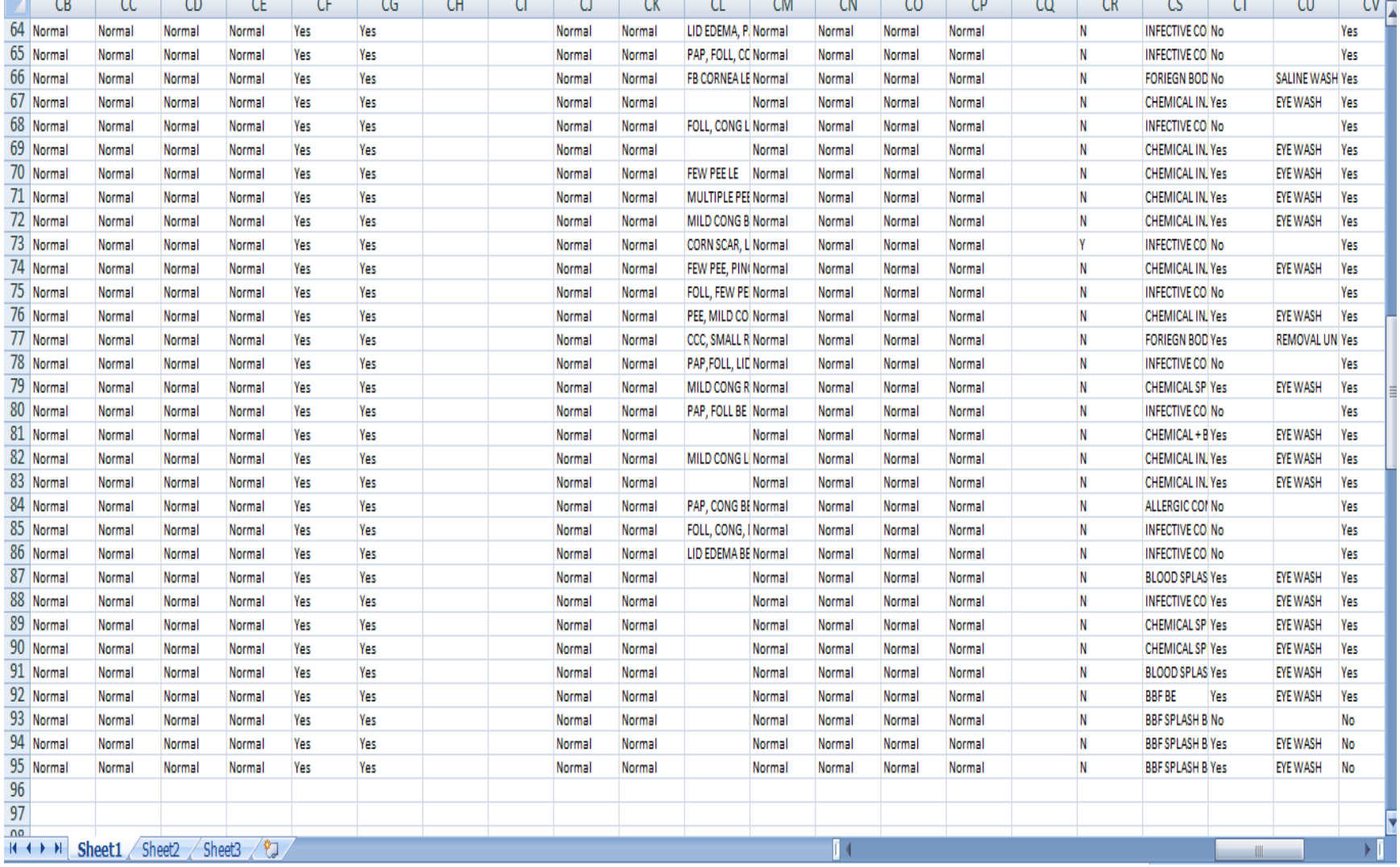

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65	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	PAP, FOLL, CC	Normal	Normal	Normal	Normal		N	INFECTIVE CO	No		Yes
66	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	FB CORNEA LE	Normal	Normal	Normal	Normal		N	FORIEGN BOD	No	SALINE WASH	Yes
67	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal		Normal	Normal	Normal	Normal		N	CHEMICAL IN.	Yes	EYE WASH	Yes
68	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	FOLL, CONG L	Normal	Normal	Normal	Normal		N	INFECTIVE CO	No		Yes
69	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal		Normal	Normal	Normal	Normal		N	CHEMICAL IN.	Yes	EYE WASH	Yes
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73	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	CORN SCAR, L	Normal	Normal	Normal	Normal		Y	INFECTIVE CO	No		Yes
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75	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	FOLL, FEW PE	Normal	Normal	Normal	Normal		N	INFECTIVE CO	No		Yes
76	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	PEE, MILD CO	Normal	Normal	Normal	Normal		N	CHEMICAL IN.	Yes	EYE WASH	Yes
77	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	CCC, SMALL R	Normal	Normal	Normal	Normal		N	FORIEGN BOD	Yes	REMOVAL UN	Yes
78	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	PAP,FOLL, LID	Normal	Normal	Normal	Normal		N	INFECTIVE CO	No		Yes
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88	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal		Normal	Normal	Normal	Normal		N	INFECTIVE CO	Yes	EYE WASH	Yes
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93	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal		Normal	Normal	Normal	Normal		N	BBF SPLASH B	No		No
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97																					

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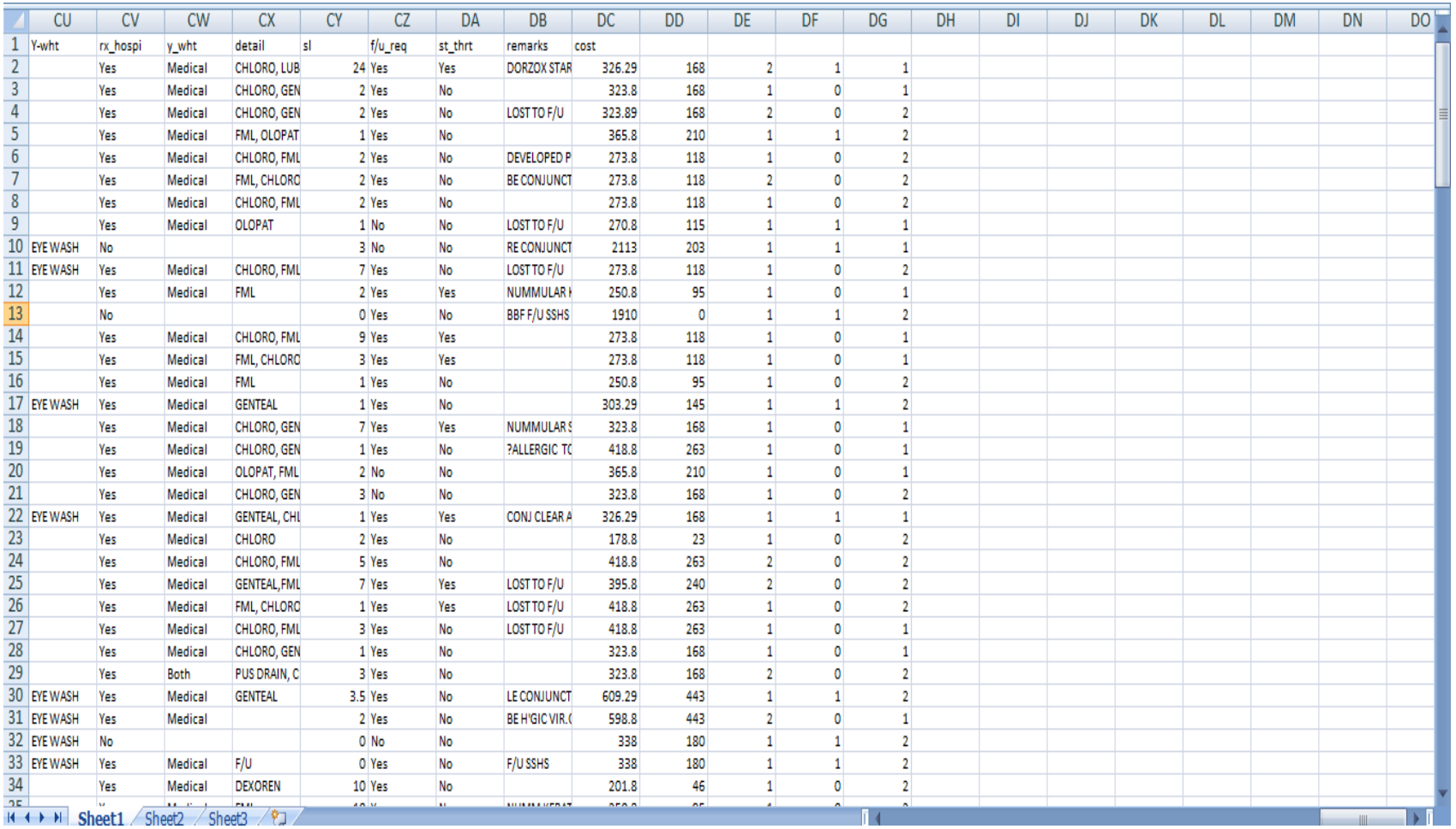

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2		Yes	Medical	CHLORO, LUB	24	Yes	Yes	DORZOX STAR	326.29	168	2	1	1								
3		Yes	Medical	CHLORO, GEN	2	Yes	No		323.8	168	1	0	1								
4		Yes	Medical	CHLORO, GEN	2	Yes	No	LOST TO F/U	323.89	168	2	0	2								
5		Yes	Medical	FML, OLOPAT	1	Yes	No		365.8	210	1	1	2								
6		Yes	Medical	CHLORO, FML	2	Yes	No	DEVELOPED P	273.8	118	1	0	2								
7		Yes	Medical	FML, CHLORO	2	Yes	No	BE CONJUNCT	273.8	118	2	0	2								
8		Yes	Medical	CHLORO, FML	2	Yes	No		273.8	118	1	0	2								
9		Yes	Medical	OLOPAT	1	No	No	LOST TO F/U	270.8	115	1	1	1								
10	EYE WASH	No			3	No	No	RE CONJUNCT	2113	203	1	1	1								
11	EYE WASH	Yes	Medical	CHLORO, FML	7	Yes	No	LOST TO F/U	273.8	118	1	0	2								
12		Yes	Medical	FML	2	Yes	Yes	NUMMULAR I	250.8	95	1	0	1								
13		No			0	Yes	No	BBF F/U SSHS	1910	0	1	1	2								
14		Yes	Medical	CHLORO, FML	9	Yes	Yes		273.8	118	1	0	1								
15		Yes	Medical	FML, CHLORO	3	Yes	Yes		273.8	118	1	0	1								
16		Yes	Medical	FML	1	Yes	No		250.8	95	1	0	2								
17	EYE WASH	Yes	Medical	GENTEAL	1	Yes	No		303.29	145	1	1	2								
18		Yes	Medical	CHLORO, GEN	7	Yes	Yes	NUMMULAR S	323.8	168	1	0	1								
19		Yes	Medical	CHLORO, GEN	1	Yes	No	?ALLERGIC TO	418.8	263	1	0	1								
20		Yes	Medical	OLOPAT, FML	2	No	No		365.8	210	1	0	1								
21		Yes	Medical	CHLORO, GEN	3	No	No		323.8	168	1	0	2								
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24		Yes	Medical	CHLORO, FML	5	Yes	No		418.8	263	2	0	2								
25		Yes	Medical	GENTEAL, FML	7	Yes	Yes	LOST TO F/U	395.8	240	2	0	2								
26		Yes	Medical	FML, CHLORO	1	Yes	Yes	LOST TO F/U	418.8	263	1	0	2								
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32	EYE WASH	No			0	No	No		338	180	1	1	2								
33	EYE WASH	Yes	Medical	F/U	0	Yes	No	F/U SSHS	338	180	1	1	2								
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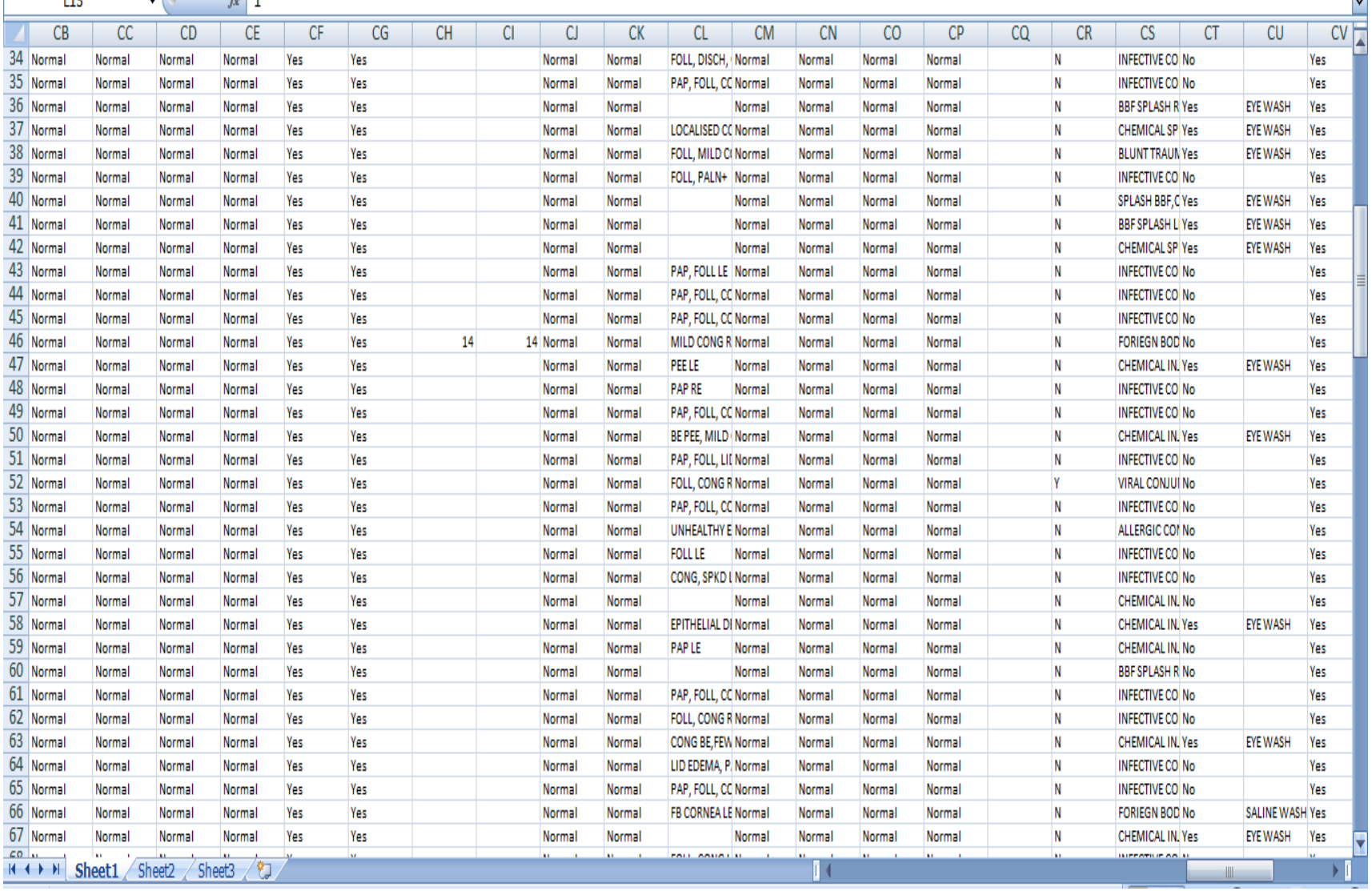
Sheet1 Sheet2 Sheet3



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36	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal		Normal	Normal	Normal	Normal		N	BBF SPLASH R	Yes	EYE WASH	Yes
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38	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	FOLL, MILD CI	Normal	Normal	Normal	Normal		N	BLUNT TRAUN	Yes	EYE WASH	Yes
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42	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal		Normal	Normal	Normal	Normal		N	CHEMICAL SP	Yes	EYE WASH	Yes
43	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	PAP, FOLL LE	Normal	Normal	Normal	Normal		N	INFECTIVE CO	No		Yes
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66	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	FB CORNEA LE	Normal	Normal	Normal	Normal		N	FORIEGN BOD	No	SALINE WASH	Yes
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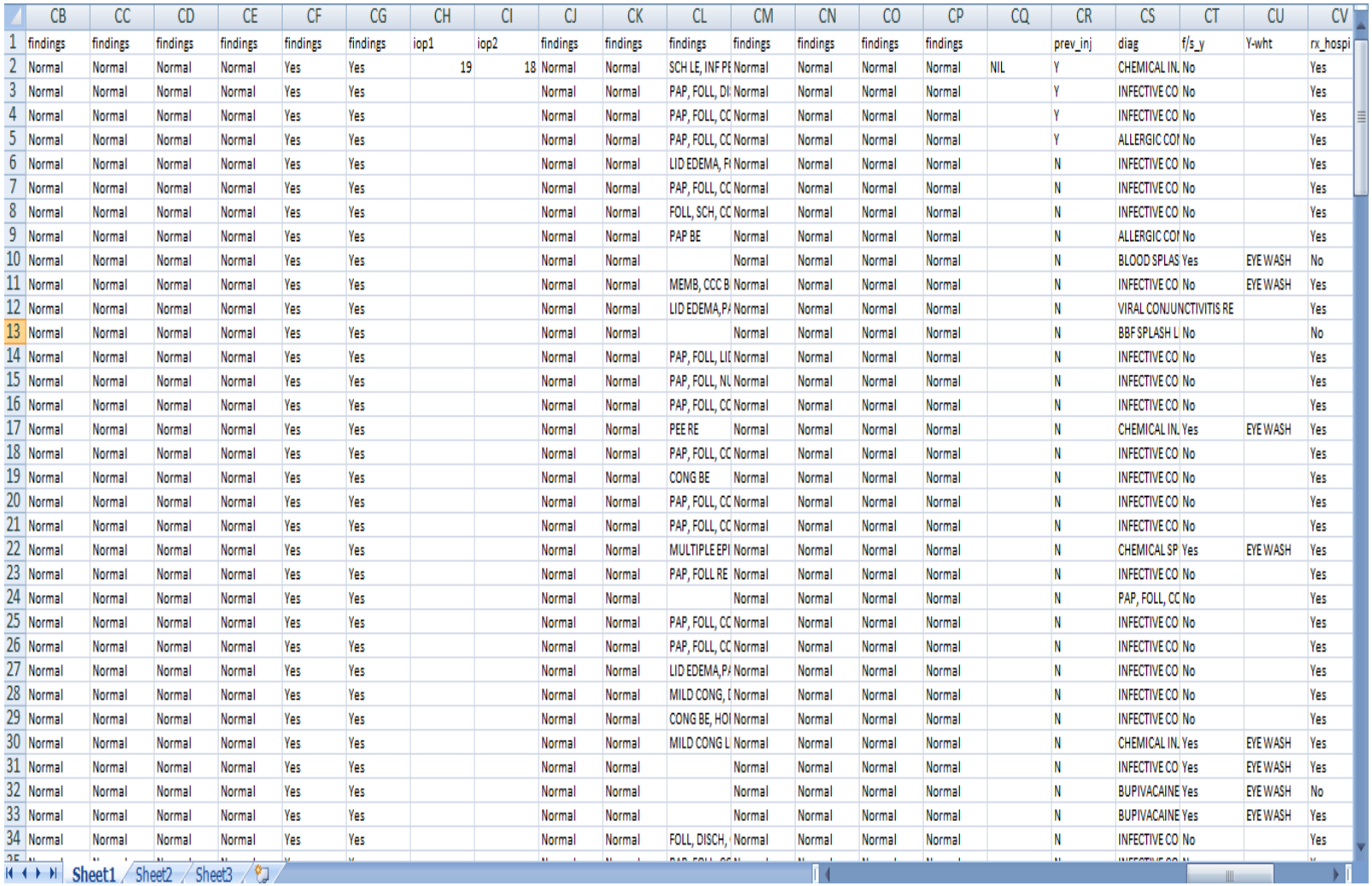
Sheet1 Sheet2 Sheet3



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3	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	PAP, FOLL, DI	Normal	Normal	Normal	Normal		Y	INFECTIVE CO	No		Yes
4	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	PAP, FOLL, CC	Normal	Normal	Normal	Normal		Y	INFECTIVE CO	No		Yes
5	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	PAP, FOLL, CC	Normal	Normal	Normal	Normal		Y	ALLERGIC CO	No		Yes
6	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	LID EDEMA, FI	Normal	Normal	Normal	Normal		N	INFECTIVE CO	No		Yes
7	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	PAP, FOLL, CC	Normal	Normal	Normal	Normal		N	INFECTIVE CO	No		Yes
8	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	FOLL, SCH, CC	Normal	Normal	Normal	Normal		N	INFECTIVE CO	No		Yes
9	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	PAP BE	Normal	Normal	Normal	Normal		N	ALLERGIC CO	No		Yes
10	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal		Normal	Normal	Normal	Normal		N	BLOOD SPLAS	Yes	EYE WASH	No
11	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	MEMB, CCC B	Normal	Normal	Normal	Normal		N	INFECTIVE CO	No	EYE WASH	Yes
12	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	LID EDEMA, PA	Normal	Normal	Normal	Normal		N	VIRAL CONJUN	CTIVITIS RE		Yes
13	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal		Normal	Normal	Normal	Normal		N	BBF SPLASH L	No		No
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17	Normal	Normal	Normal	Normal	Yes	Yes			Normal	Normal	PEE RE	Normal	Normal	Normal	Normal		N	CHEMICAL IN.	Yes	EYE WASH	Yes
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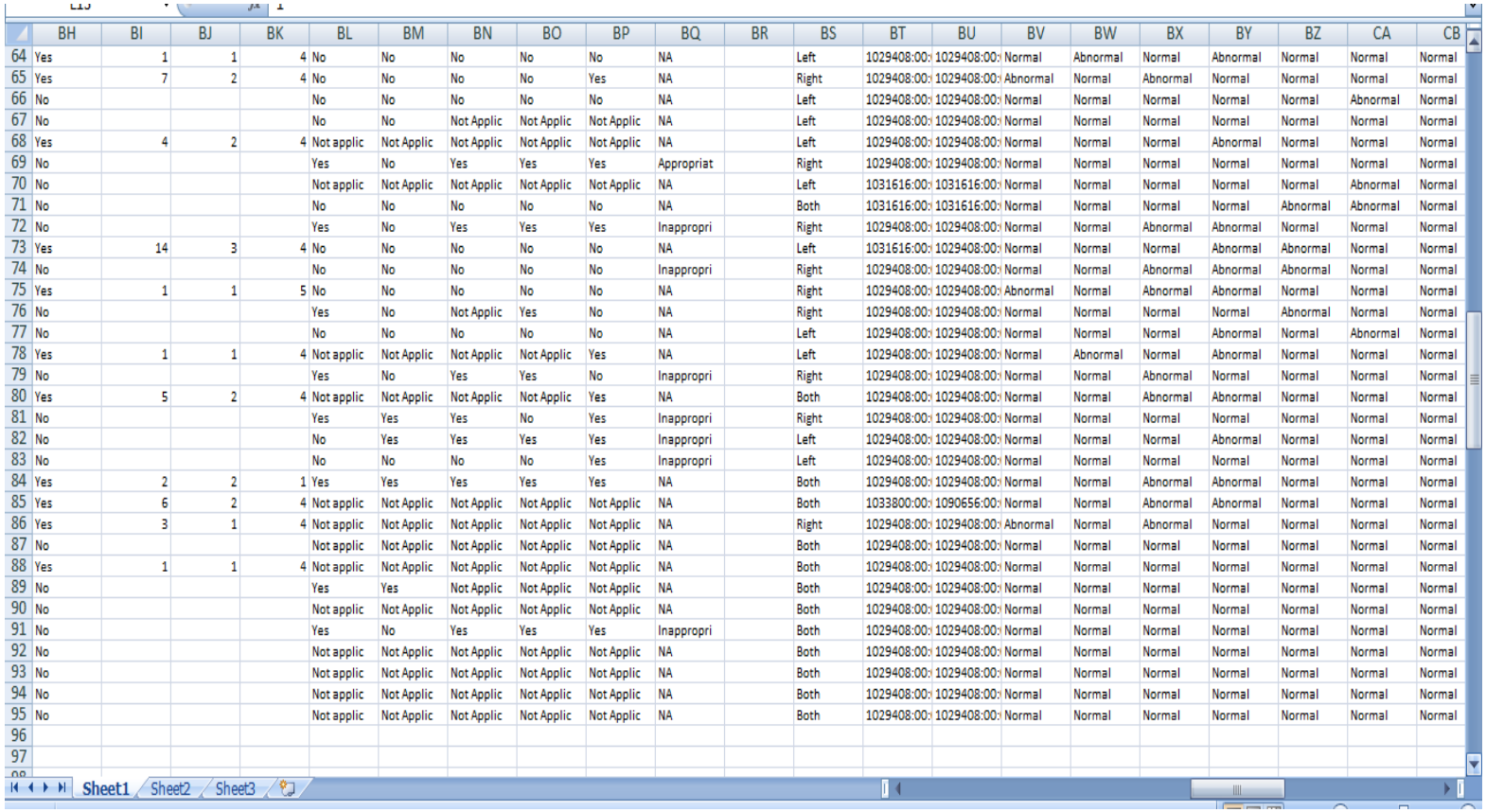
Sheet1 Sheet2 Sheet3



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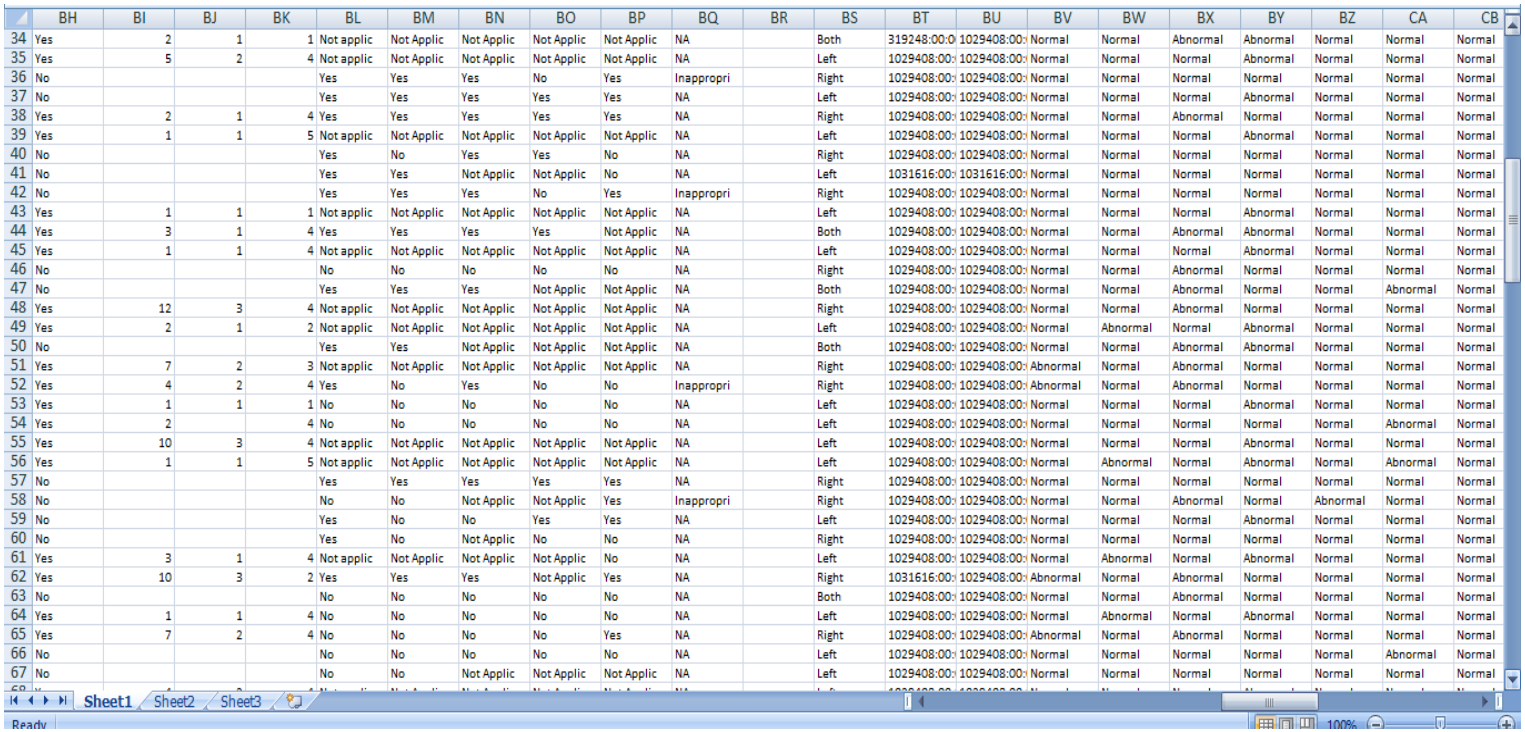
Sheet1 Sheet2 Sheet3



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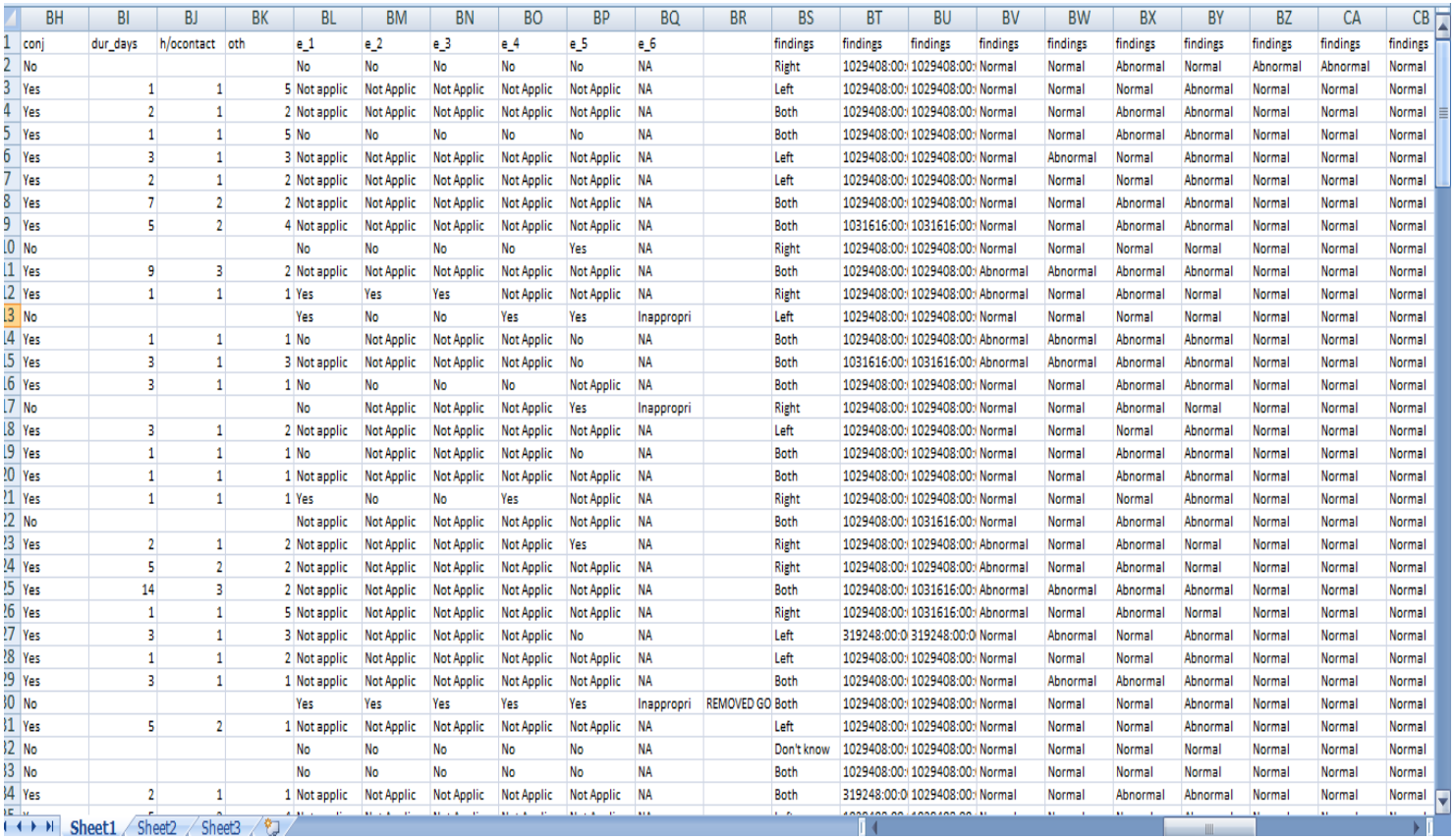

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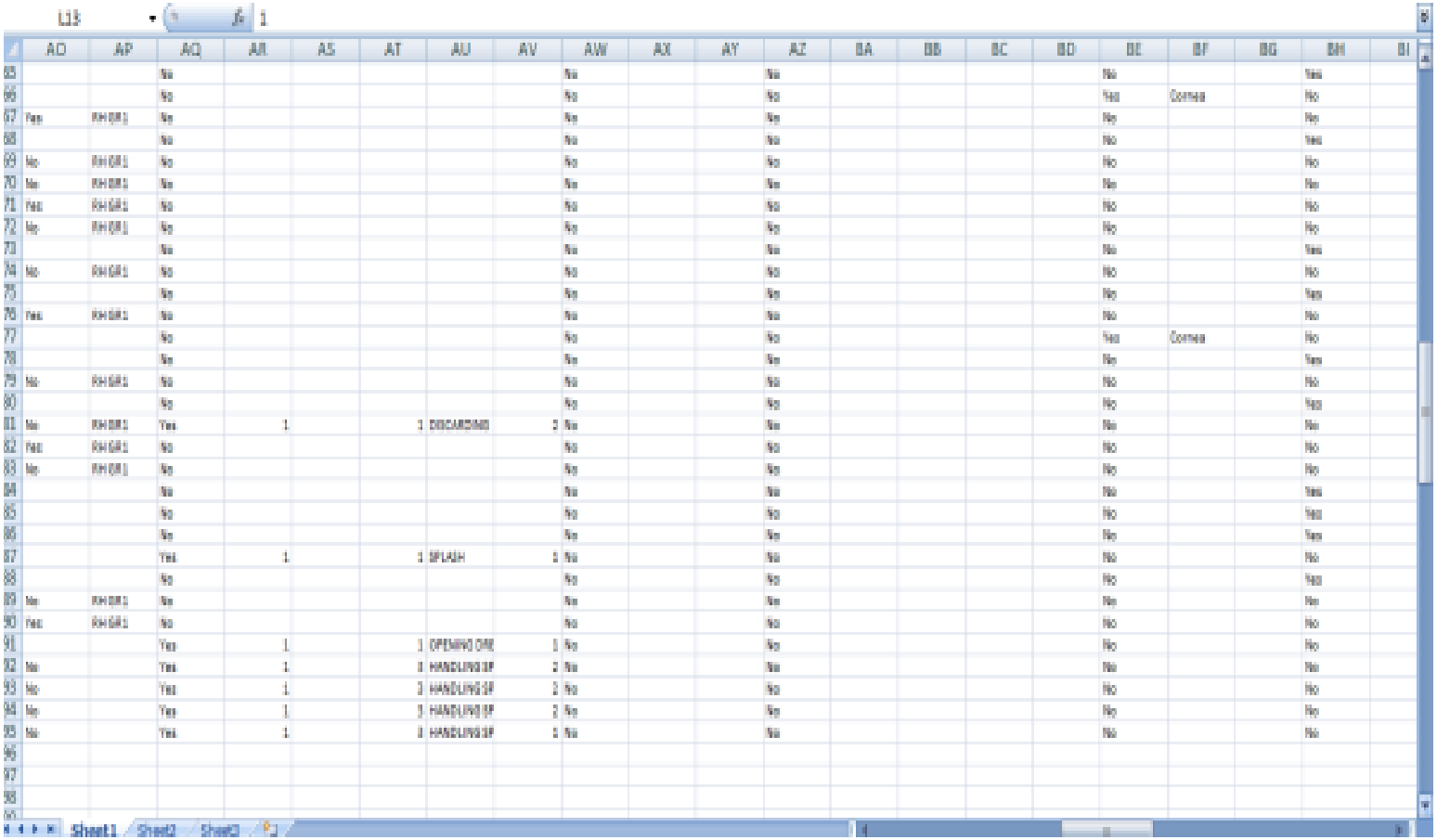
Sheet1 Sheet2 Sheet3



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66			No						No			No					Yes	Cornea		No	
67	Yes	RHOR1	No						No			No					No			No	
68			No						No			No					No			Yes	
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93	No		Yes	1		1	HANDLING IP	2	No			No					No			No	
94	No		Yes	1		1	HANDLING IP	2	No			No					No			No	
95	No		Yes	1		1	HANDLING IP	1	No			No					No			No	
96																					
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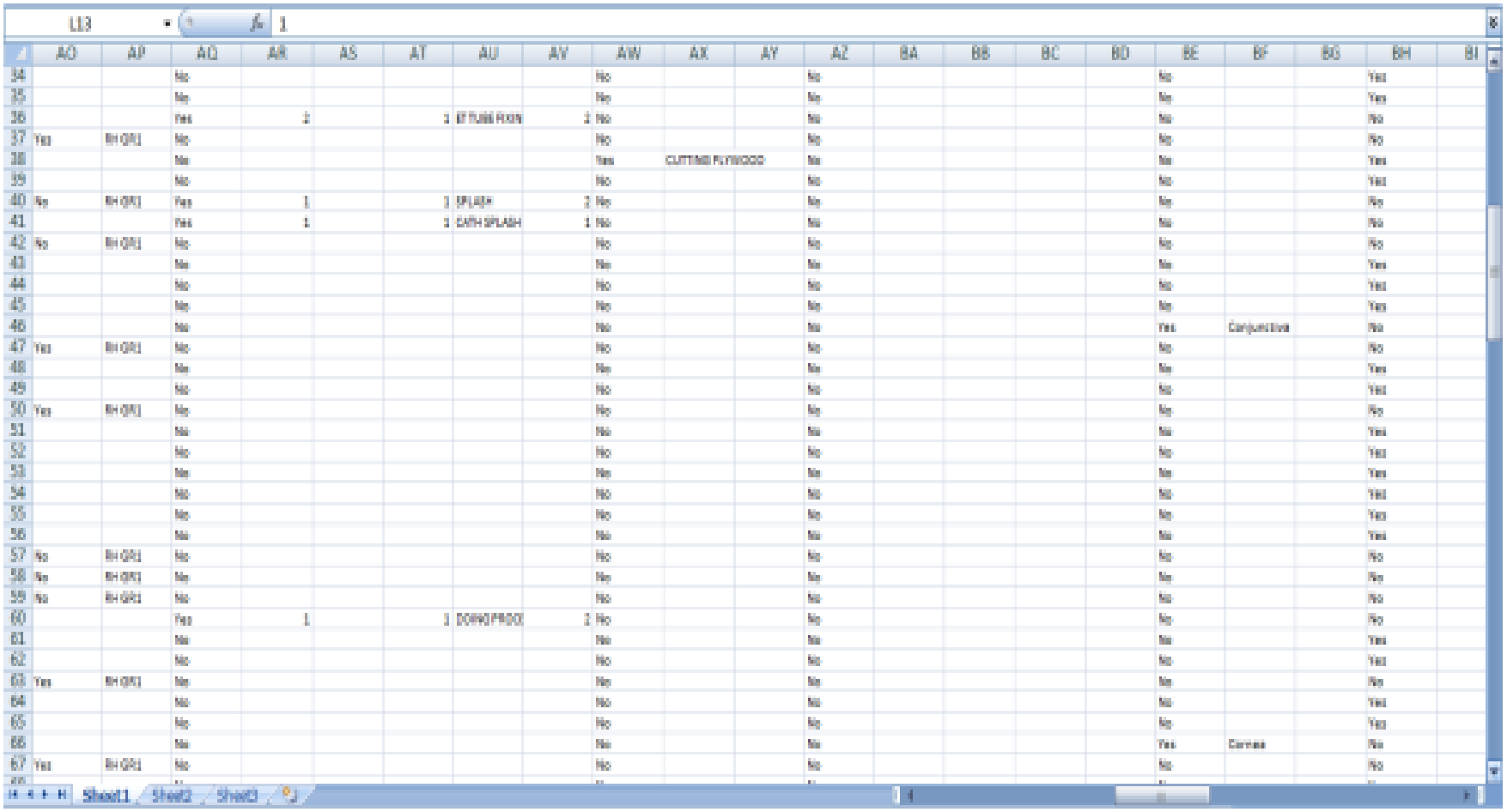
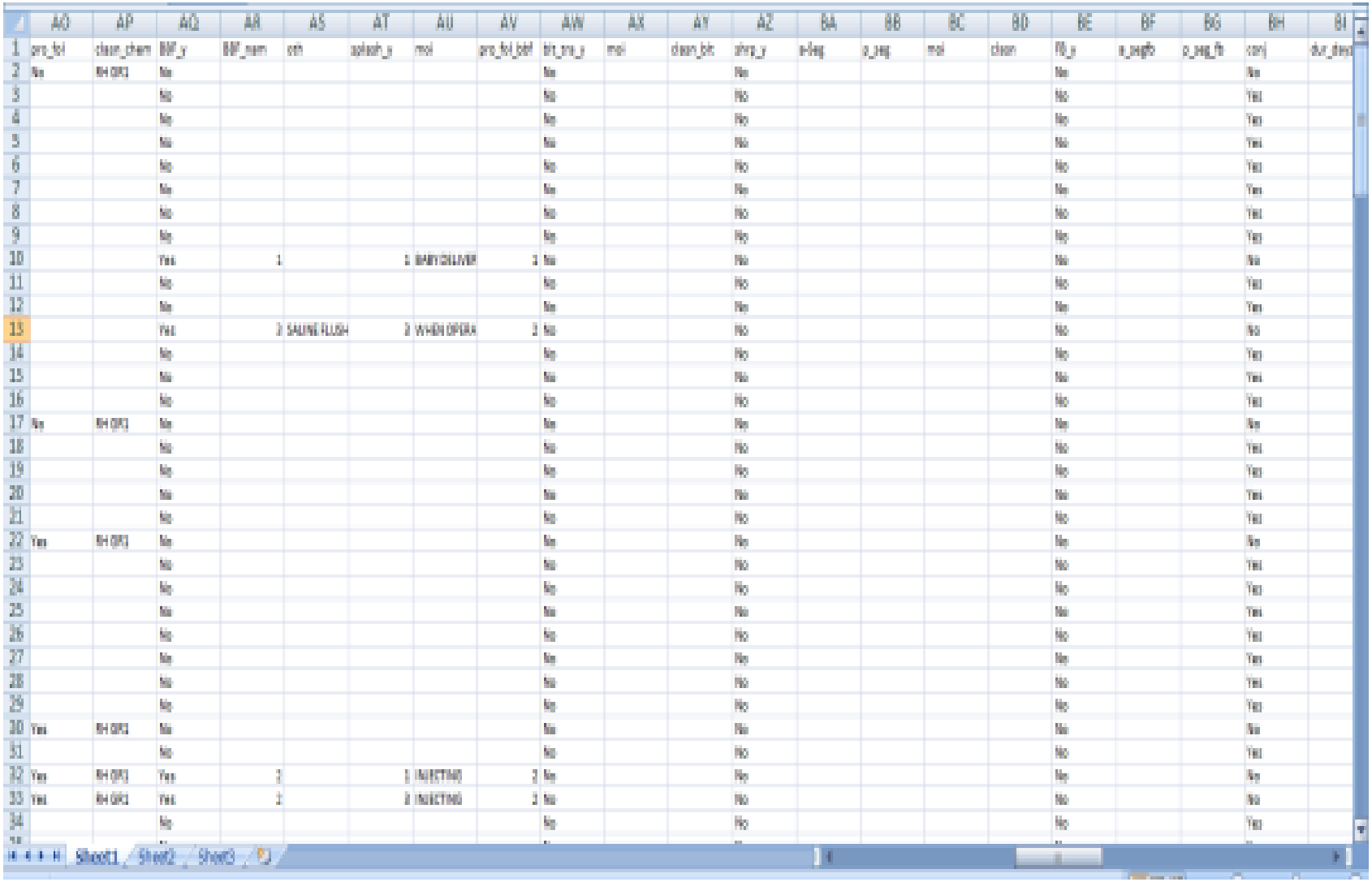
98																					



	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI
34			No						No			No					No			Yes	
35			No						No			No					No			Yes	
36			Yes	2		1	EFTUBE FOUN	2	No			No					No			No	
37	Yes	RH QR1	No						No			No					No			No	
38			No						Yes	CUTTING PLYWOOD		No					No			Yes	
39			No						No			No					No			Yes	
40	No	RH QR1	Yes	1		1	SPLASH	1	No			No					No			No	
41			Yes	1		1	BATH SPLASH	1	No			No					No			No	
42	No	RH QR1	No						No			No					No			No	
43			No						No			No					No			Yes	
44			No						No			No					No			Yes	
45			No						No			No					No			Yes	
46			No						No			No					Yes	Conjunctiva		No	
47	Yes	RH QR1	No						No			No					No			No	
48			No						No			No					No			Yes	
49			No						No			No					No			Yes	
50	Yes	RH QR1	No						No			No					No			No	
51			No						No			No					No			Yes	
52			No						No			No					No			Yes	
53			No						No			No					No			Yes	
54			No						No			No					No			Yes	
55			No						No			No					No			Yes	
56			No						No			No					No			Yes	
57	No	RH QR1	No						No			No					No			No	
58	No	RH QR1	No						No			No					No			No	
59	No	RH QR1	No						No			No					No			No	
60			Yes	1		1	DOPHOPROOF	1	No			No					No			No	
61			No						No			No					No			Yes	
62			No						No			No					No			Yes	
63	Yes	RH QR1	No						No			No					No			No	
64			No						No			No					No			Yes	
65			No						No			No					No			Yes	
66			No						No			No					Yes	Cornea		No	
67	Yes	RH QR1	No						No			No					No			No	



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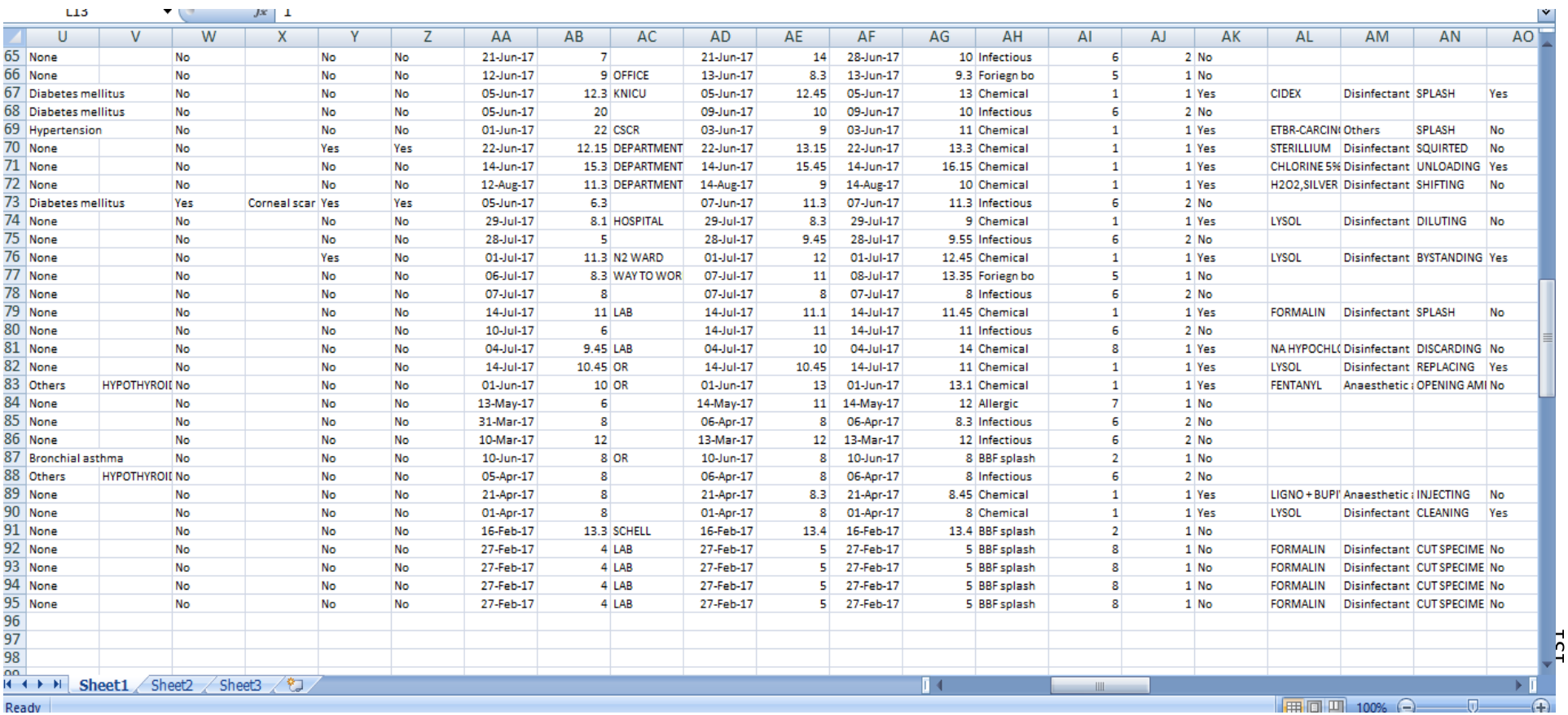
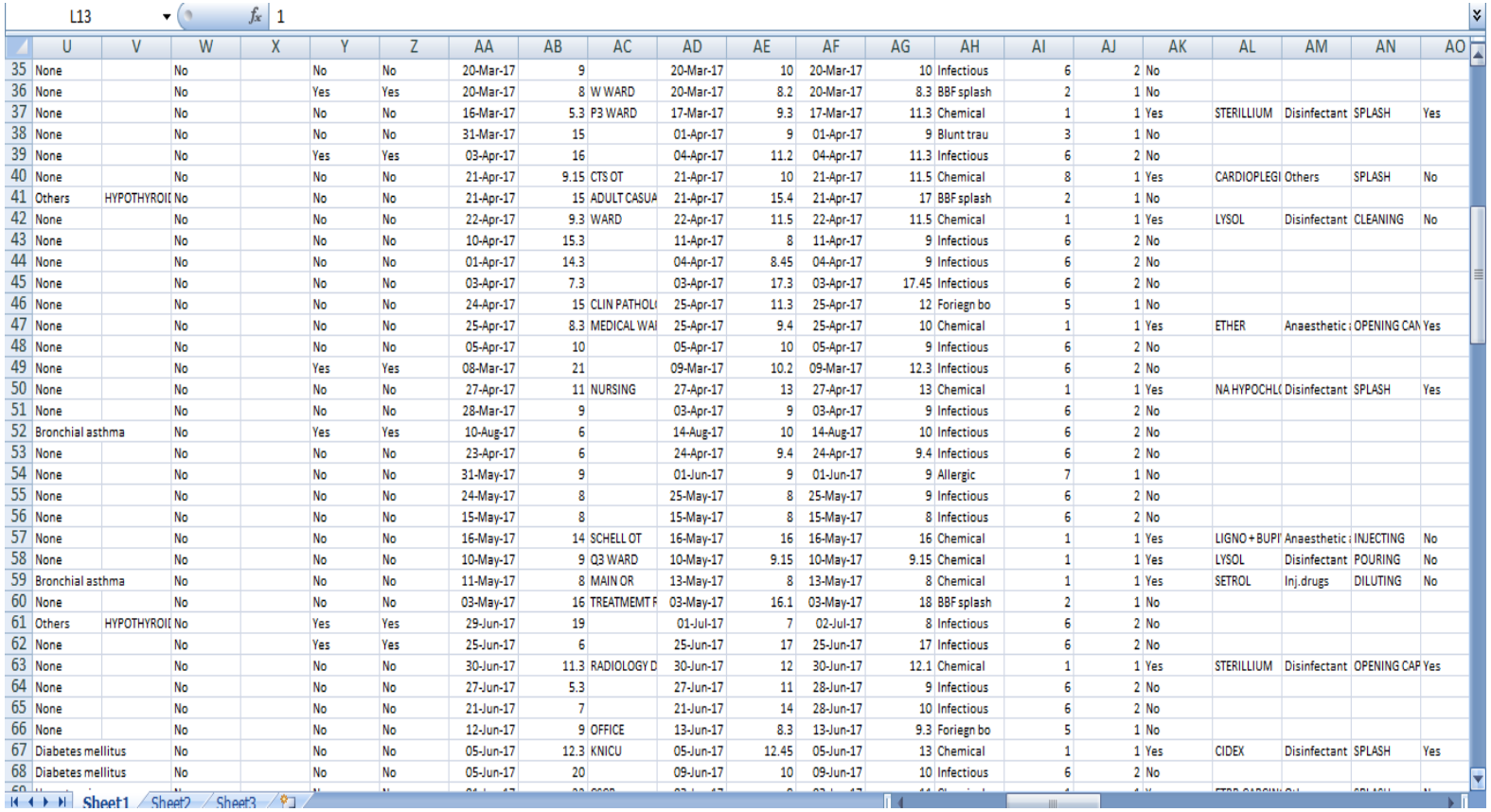
1	pro_bl	clean_chem	BIF_y	BIF_num	oth	splash_y	mxi	pro_bl_bbf	bl_pro_y	mxi	clean_bk	shrs_y	w-leg	o_leg	mxi	clean	fll_y	o_segfb	o_seg_fb	conj	dur_days
2	No	RHDR1	No						No			No					No			No	
3			No						No			No					No			Yes	
4			No						No			No					No			Yes	
5			No						No			No					No			Yes	
6			No						No			No					No			Yes	
7			No						No			No					No			Yes	
8			No						No			No					No			Yes	
9			No						No			No					No			Yes	
10			Yes	1		1	BABY DELIVER	1	No			No					No			No	
11			No						No			No					No			Yes	
12			No						No			No					No			Yes	
13			Yes	1	SALINE FLUSH	1	WHEN OPERA	1	No			No					No			No	
14			No						No			No					No			Yes	
15			No						No			No					No			Yes	
16			No						No			No					No			Yes	
17	No	RHDR1	No						No			No					No			No	
18			No						No			No					No			Yes	
19			No						No			No					No			Yes	
20			No						No			No					No			Yes	
21			No						No			No					No			Yes	
22	Yes	RHDR1	No						No			No					No			No	
23			No						No			No					No			Yes	
24			No						No			No					No			Yes	
25			No						No			No					No			Yes	
26			No						No			No					No			Yes	
27			No						No			No					No			Yes	
28			No						No			No					No			Yes	
29			No						No			No					No			Yes	
30	Yes	RHDR1	No						No			No					No			No	
31			No						No			No					No			Yes	
32	Yes	RHDR1	Yes	1		1	INJECTIVO	1	No			No					No			No	
33	Yes	RHDR1	Yes	1		1	INJECTIVO	1	No			No					No			No	
34			No						No			No					No			Yes	



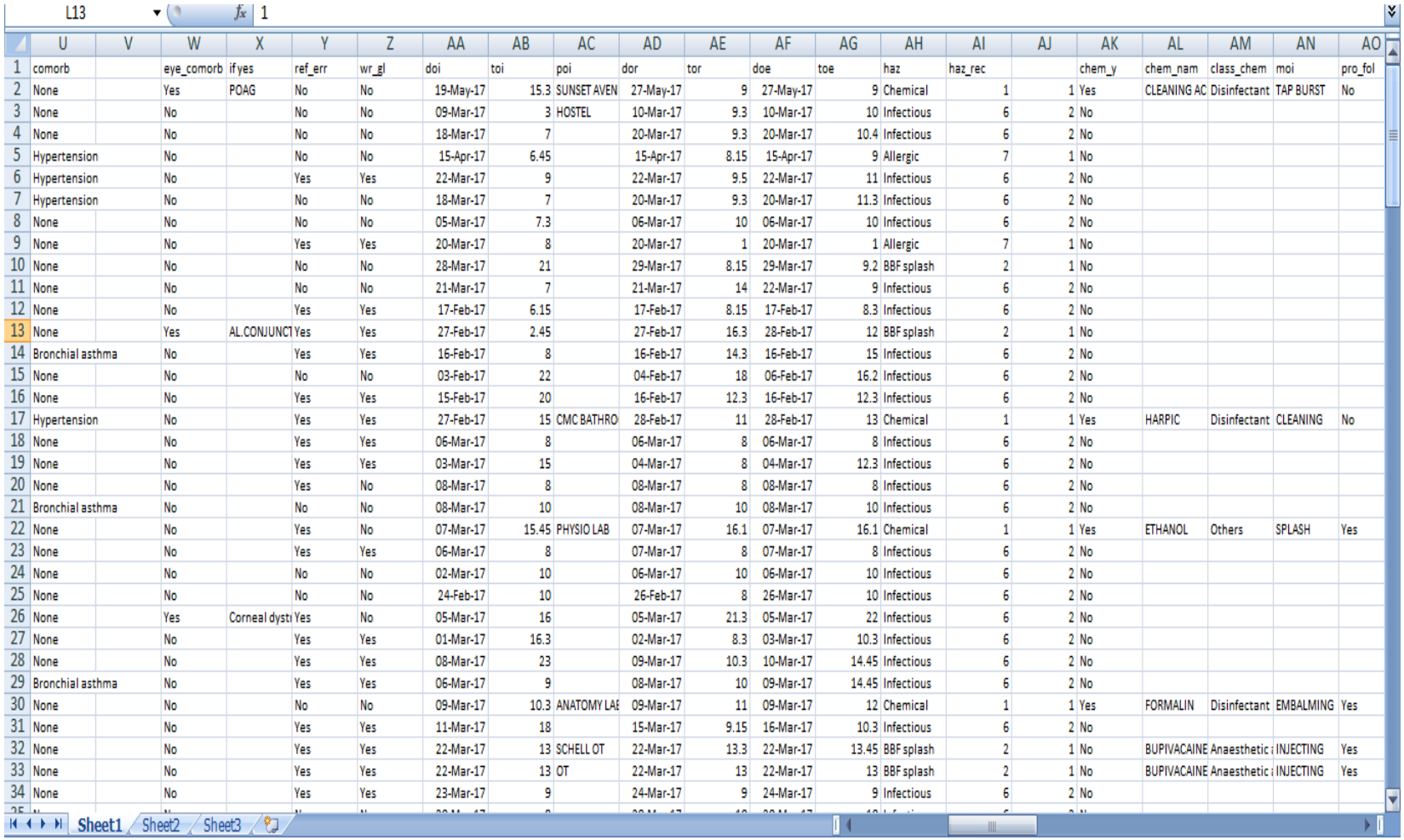
	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
65	None		No		No	No	21-Jun-17	7		21-Jun-17	14	28-Jun-17	10	Infectious	6	2	No				
66	None		No		No	No	12-Jun-17	9	OFFICE	13-Jun-17	8.3	13-Jun-17	9.3	Foriegn bo	5	1	No				
67	Diabetes mellitus		No		No	No	05-Jun-17	12.3	KNICU	05-Jun-17	12.45	05-Jun-17	13	Chemical	1	1	Yes	CIDEX	Disinfectant	SPLASH	Yes
68	Diabetes mellitus		No		No	No	05-Jun-17	20		09-Jun-17	10	09-Jun-17	10	Infectious	6	2	No				
69	Hypertension		No		No	No	01-Jun-17	22	CSCR	03-Jun-17	9	03-Jun-17	11	Chemical	1	1	Yes	ETBR-CARCIN	Others	SPLASH	No
70	None		No		Yes	Yes	22-Jun-17	12.15	DEPARTMENT	22-Jun-17	13.15	22-Jun-17	13.3	Chemical	1	1	Yes	STERILLIUM	Disinfectant	SQUIRTED	No
71	None		No		No	No	14-Jun-17	15.3	DEPARTMENT	14-Jun-17	15.45	14-Jun-17	16.15	Chemical	1	1	Yes	CHLORINE 5%	Disinfectant	UNLOADING	Yes
72	None		No		No	No	12-Aug-17	11.3	DEPARTMENT	14-Aug-17	9	14-Aug-17	10	Chemical	1	1	Yes	H2O2,SILVER	Disinfectant	SHIFTING	No
73	Diabetes mellitus		Yes	Corneal scar	Yes	Yes	05-Jun-17	6.3		07-Jun-17	11.3	07-Jun-17	11.3	Infectious	6	2	No				
74	None		No		No	No	29-Jul-17	8.1	HOSPITAL	29-Jul-17	8.3	29-Jul-17	9	Chemical	1	1	Yes	LYSOL	Disinfectant	DILUTING	No
75	None		No		No	No	28-Jul-17	5		28-Jul-17	9.45	28-Jul-17	9.55	Infectious	6	2	No				
76	None		No		Yes	No	01-Jul-17	11.3	N2 WARD	01-Jul-17	12	01-Jul-17	12.45	Chemical	1	1	Yes	LYSOL	Disinfectant	BYSTANDING	Yes
77	None		No		No	No	06-Jul-17	8.3	WAY TO WOR	07-Jul-17	11	08-Jul-17	13.35	Foriegn bo	5	1	No				
78	None		No		No	No	07-Jul-17	8		07-Jul-17	8	07-Jul-17	8	Infectious	6	2	No				
79	None		No		No	No	14-Jul-17	11	LAB	14-Jul-17	11.1	14-Jul-17	11.45	Chemical	1	1	Yes	FORMALIN	Disinfectant	SPLASH	No
80	None		No		No	No	10-Jul-17	6		14-Jul-17	11	14-Jul-17	11	Infectious	6	2	No				
81	None		No		No	No	04-Jul-17	9.45	LAB	04-Jul-17	10	04-Jul-17	14	Chemical	8	1	Yes	NA HYPOCHL	Disinfectant	DISCARDING	No
82	None		No		No	No	14-Jul-17	10.45	OR	14-Jul-17	10.45	14-Jul-17	11	Chemical	1	1	Yes	LYSOL	Disinfectant	REPLACING	Yes
83	Others	HYPOTHYROII	No		No	No	01-Jun-17	10	OR	01-Jun-17	13	01-Jun-17	13.1	Chemical	1	1	Yes	FENTANYL	Anaesthetic	OPENING AMI	No
84	None		No		No	No	13-May-17	6		14-May-17	11	14-May-17	12	Allergic	7	1	No				
85	None		No		No	No	31-Mar-17	8		06-Apr-17	8	06-Apr-17	8.3	Infectious	6	2	No				
86	None		No		No	No	10-Mar-17	12		13-Mar-17	12	13-Mar-17	12	Infectious	6	2	No				
87	Bronchial asthma		No		No	No	10-Jun-17	8	OR	10-Jun-17	8	10-Jun-17	8	BBF splash	2	1	No				
88	Others	HYPOTHYROII	No		No	No	05-Apr-17	8		06-Apr-17	8	06-Apr-17	8	Infectious	6	2	No				
89	None		No		No	No	21-Apr-17	8		21-Apr-17	8.3	21-Apr-17	8.45	Chemical	1	1	Yes	LIGNO + BUPI	Anaesthetic	INJECTING	No
90	None		No		No	No	01-Apr-17	8		01-Apr-17	8	01-Apr-17	8	Chemical	1	1	Yes	LYSOL	Disinfectant	CLEANING	Yes
91	None		No		No	No	16-Feb-17	13.3	SCHELL	16-Feb-17	13.4	16-Feb-17	13.4	BBF splash	2	1	No				
92	None		No		No	No	27-Feb-17	4	LAB	27-Feb-17	5	27-Feb-17	5	BBF splash	8	1	No	FORMALIN	Disinfectant	CUT SPECIME	No
93	None		No		No	No	27-Feb-17	4	LAB	27-Feb-17	5	27-Feb-17	5	BBF splash	8	1	No	FORMALIN	Disinfectant	CUT SPECIME	No
94	None		No		No	No	27-Feb-17	4	LAB	27-Feb-17	5	27-Feb-17	5	BBF splash	8	1	No	FORMALIN	Disinfectant	CUT SPECIME	No
95	None		No		No	No	27-Feb-17	4	LAB	27-Feb-17	5	27-Feb-17	5	BBF splash	8	1	No	FORMALIN	Disinfectant	CUT SPECIME	No
96																					
97																					
98																					



L13 | 1

	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
35	None		No		No	No	20-Mar-17	9		20-Mar-17	10	20-Mar-17	10	Infectious	6	2	No				
36	None		No		Yes	Yes	20-Mar-17	8	W WARD	20-Mar-17	8.2	20-Mar-17	8.3	BBF splash	2	1	No				
37	None		No		No	No	16-Mar-17	5.3	P3 WARD	17-Mar-17	9.3	17-Mar-17	11.3	Chemical	1	1	Yes	STERILLIUM	Disinfectant	SPLASH	Yes
38	None		No		No	No	31-Mar-17	15		01-Apr-17	9	01-Apr-17	9	Blunt trau	3	1	No				
39	None		No		Yes	Yes	03-Apr-17	16		04-Apr-17	11.2	04-Apr-17	11.3	Infectious	6	2	No				
40	None		No		No	No	21-Apr-17	9.15	CTS OT	21-Apr-17	10	21-Apr-17	11.5	Chemical	8	1	Yes	CARDIOPLEGI	Others	SPLASH	No
41	Others	HYPOTHYROIC	No		No	No	21-Apr-17	15	ADULT CASUA	21-Apr-17	15.4	21-Apr-17	17	BBF splash	2	1	No				
42	None		No		No	No	22-Apr-17	9.3	WARD	22-Apr-17	11.5	22-Apr-17	11.5	Chemical	1	1	Yes	LYSOL	Disinfectant	CLEANING	No
43	None		No		No	No	10-Apr-17	15.3		11-Apr-17	8	11-Apr-17	9	Infectious	6	2	No				
44	None		No		No	No	01-Apr-17	14.3		04-Apr-17	8.45	04-Apr-17	9	Infectious	6	2	No				
45	None		No		No	No	03-Apr-17	7.3		03-Apr-17	17.3	03-Apr-17	17.45	Infectious	6	2	No				
46	None		No		No	No	24-Apr-17	15	CLIN PATHOL(	25-Apr-17	11.3	25-Apr-17	12	Foriegn bo	5	1	No				
47	None		No		No	No	25-Apr-17	8.3	MEDICAL WAI	25-Apr-17	9.4	25-Apr-17	10	Chemical	1	1	Yes	ETHER	Anaesthetic a	OPENING CAN	Yes
48	None		No		No	No	05-Apr-17	10		05-Apr-17	10	05-Apr-17	9	Infectious	6	2	No				
49	None		No		Yes	Yes	08-Mar-17	21		09-Mar-17	10.2	09-Mar-17	12.3	Infectious	6	2	No				
50	None		No		No	No	27-Apr-17	11	NURSING	27-Apr-17	13	27-Apr-17	13	Chemical	1	1	Yes	NA HYPOCHL(	Disinfectant	SPLASH	Yes
51	None		No		No	No	28-Mar-17	9		03-Apr-17	9	03-Apr-17	9	Infectious	6	2	No				
52	Bronchial asthma		No		Yes	Yes	10-Aug-17	6		14-Aug-17	10	14-Aug-17	10	Infectious	6	2	No				
53	None		No		No	No	23-Apr-17	6		24-Apr-17	9.4	24-Apr-17	9.4	Infectious	6	2	No				
54	None		No		No	No	31-May-17	9		01-Jun-17	9	01-Jun-17	9	Allergic	7	1	No				
55	None		No		No	No	24-May-17	8		25-May-17	8	25-May-17	9	Infectious	6	2	No				
56	None		No		No	No	15-May-17	8		15-May-17	8	15-May-17	8	Infectious	6	2	No				
57	None		No		No	No	16-May-17	14	SCHELL OT	16-May-17	16	16-May-17	16	Chemical	1	1	Yes	LIGNO + BUPI	Anaesthetic a	INJECTING	No
58	None		No		No	No	10-May-17	9	Q3 WARD	10-May-17	9.15	10-May-17	9.15	Chemical	1	1	Yes	LYSOL	Disinfectant	POURING	No
59	Bronchial asthma		No		No	No	11-May-17	8	MAIN OR	13-May-17	8	13-May-17	8	Chemical	1	1	Yes	SETROL	Inj.drugs	DILUTING	No
60	None		No		No	No	03-May-17	16	TREATMEMT F	03-May-17	16.1	03-May-17	18	BBF splash	2	1	No				
61	Others	HYPOTHYROIC	No		Yes	Yes	29-Jun-17	19		01-Jul-17	7	02-Jul-17	8	Infectious	6	2	No				
62	None		No		Yes	Yes	25-Jun-17	6		25-Jun-17	17	25-Jun-17	17	Infectious	6	2	No				
63	None		No		No	No	30-Jun-17	11.3	RADIOLOGY D	30-Jun-17	12	30-Jun-17	12.1	Chemical	1	1	Yes	STERILLIUM	Disinfectant	OPENING CAP	Yes
64	None		No		No	No	27-Jun-17	5.3		27-Jun-17	11	28-Jun-17	9	Infectious	6	2	No				
65	None		No		No	No	21-Jun-17	7		21-Jun-17	14	28-Jun-17	10	Infectious	6	2	No				
66	None		No		No	No	12-Jun-17	9	OFFICE	13-Jun-17	8.3	13-Jun-17	9.3	Foriegn bo	5	1	No				
67	Diabetes mellitus		No		No	No	05-Jun-17	12.3	KNICU	05-Jun-17	12.45	05-Jun-17	13	Chemical	1	1	Yes	CIDEX	Disinfectant	SPLASH	Yes
68	Diabetes mellitus		No		No	No	05-Jun-17	20		09-Jun-17	10	09-Jun-17	10	Infectious	6	2	No				

Sheet1 Sheet2 Sheet3

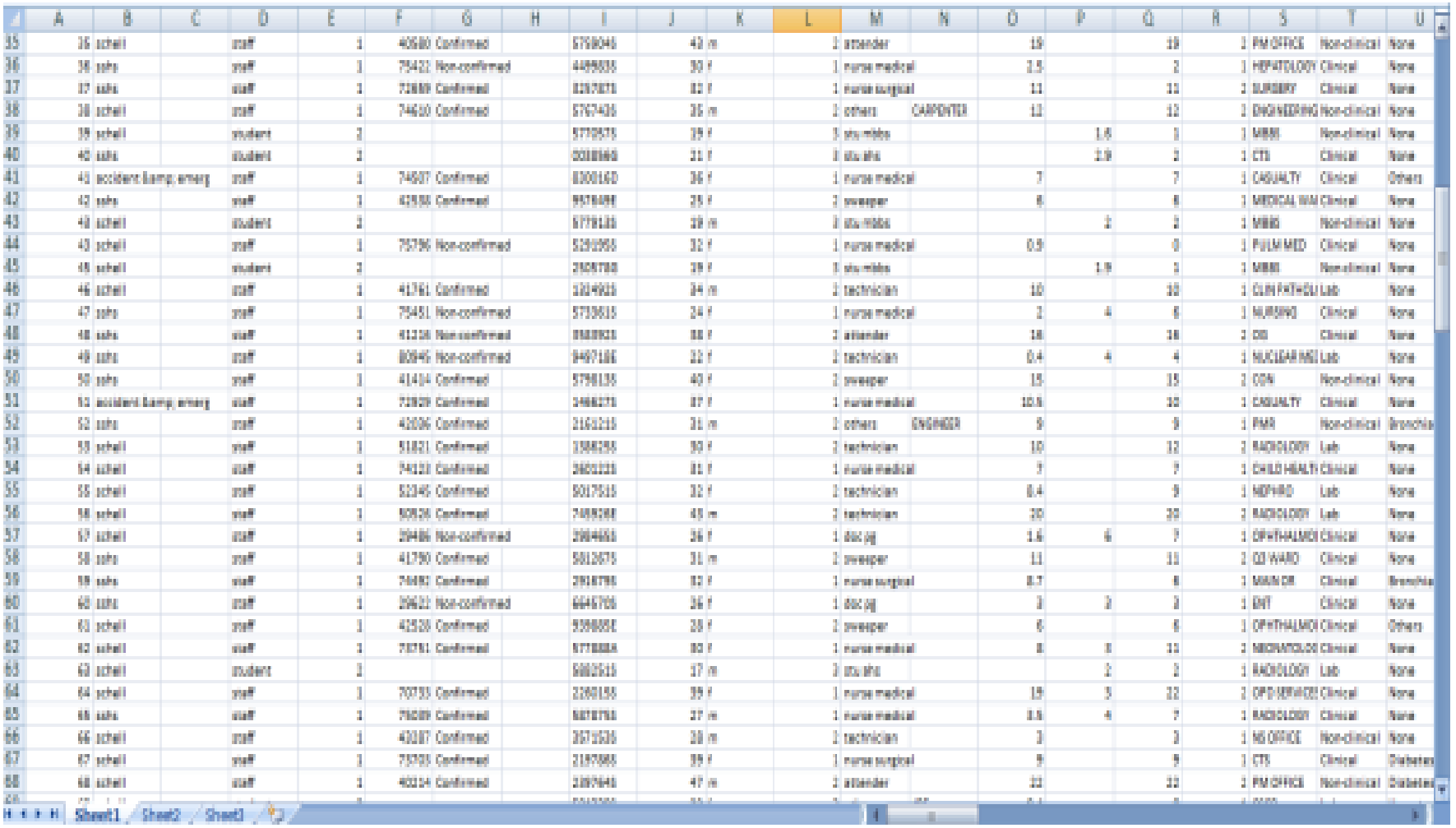


L13 1

	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1	comorb		eye_comorb	if yes	ref_err	wr_gl	doi	toi	poi	dor	tor	doe	toe	haz	haz_rec		chem_y	chem_nam	class_chem	moi	pro_fol
2	None		Yes	POAG	No	No	19-May-17	15.3	SUNSET AVEN	27-May-17	9	27-May-17	9	Chemical	1	1	Yes	CLEANING AC	Disinfectant	TAP BURST	No
3	None		No		No	No	09-Mar-17	3	HOSTEL	10-Mar-17	9.3	10-Mar-17	10	Infectious	6	2	No				
4	None		No		No	No	18-Mar-17	7		20-Mar-17	9.3	20-Mar-17	10.4	Infectious	6	2	No				
5	Hypertension		No		No	No	15-Apr-17	6.45		15-Apr-17	8.15	15-Apr-17	9	Allergic	7	1	No				
6	Hypertension		No		Yes	Yes	22-Mar-17	9		22-Mar-17	9.5	22-Mar-17	11	Infectious	6	2	No				
7	Hypertension		No		No	No	18-Mar-17	7		20-Mar-17	9.3	20-Mar-17	11.3	Infectious	6	2	No				
8	None		No		No	No	05-Mar-17	7.3		06-Mar-17	10	06-Mar-17	10	Infectious	6	2	No				
9	None		No		Yes	Yes	20-Mar-17	8		20-Mar-17	1	20-Mar-17	1	Allergic	7	1	No				
10	None		No		No	No	28-Mar-17	21		29-Mar-17	8.15	29-Mar-17	9.2	BBF splash	2	1	No				
11	None		No		No	No	21-Mar-17	7		21-Mar-17	14	22-Mar-17	9	Infectious	6	2	No				
12	None		No		Yes	Yes	17-Feb-17	6.15		17-Feb-17	8.15	17-Feb-17	8.3	Infectious	6	2	No				
13	None		Yes	AL.CONJUNCT	Yes	Yes	27-Feb-17	2.45		27-Feb-17	16.3	28-Feb-17	12	BBF splash	2	1	No				
14	Bronchial asthma		No		Yes	Yes	16-Feb-17	8		16-Feb-17	14.3	16-Feb-17	15	Infectious	6	2	No				
15	None		No		No	No	03-Feb-17	22		04-Feb-17	18	06-Feb-17	16.2	Infectious	6	2	No				
16	None		No		Yes	Yes	15-Feb-17	20		16-Feb-17	12.3	16-Feb-17	12.3	Infectious	6	2	No				
17	Hypertension		No		Yes	Yes	27-Feb-17	15	CMC BATHRO	28-Feb-17	11	28-Feb-17	13	Chemical	1	1	Yes	HARPIC	Disinfectant	CLEANING	No
18	None		No		Yes	Yes	06-Mar-17	8		06-Mar-17	8	06-Mar-17	8	Infectious	6	2	No				
19	None		No		Yes	Yes	03-Mar-17	15		04-Mar-17	8	04-Mar-17	12.3	Infectious	6	2	No				
20	None		No		Yes	No	08-Mar-17	8		08-Mar-17	8	08-Mar-17	8	Infectious	6	2	No				
21	Bronchial asthma		No		No	No	08-Mar-17	10		08-Mar-17	10	08-Mar-17	10	Infectious	6	2	No				
22	None		No		Yes	No	07-Mar-17	15.45	PHYSIO LAB	07-Mar-17	16.1	07-Mar-17	16.1	Chemical	1	1	Yes	ETHANOL	Others	SPLASH	Yes
23	None		No		Yes	Yes	06-Mar-17	8		07-Mar-17	8	07-Mar-17	8	Infectious	6	2	No				
24	None		No		No	No	02-Mar-17	10		06-Mar-17	10	06-Mar-17	10	Infectious	6	2	No				
25	None		No		No	No	24-Feb-17	10		26-Feb-17	8	26-Mar-17	10	Infectious	6	2	No				
26	None		Yes	Corneal dysti	Yes	No	05-Mar-17	16		05-Mar-17	21.3	05-Mar-17	22	Infectious	6	2	No				
27	None		No		Yes	Yes	01-Mar-17	16.3		02-Mar-17	8.3	03-Mar-17	10.3	Infectious	6	2	No				
28	None		No		Yes	Yes	08-Mar-17	23		09-Mar-17	10.3	10-Mar-17	14.45	Infectious	6	2	No				
29	Bronchial asthma		No		Yes	Yes	06-Mar-17	9		08-Mar-17	10	09-Mar-17	14.45	Infectious	6	2	No				
30	None		No		No	No	09-Mar-17	10.3	ANATOMY LAE	09-Mar-17	11	09-Mar-17	12	Chemical	1	1	Yes	FORMALIN	Disinfectant	EMBALMING	Yes
31	None		No		Yes	Yes	11-Mar-17	18		15-Mar-17	9.15	16-Mar-17	10.3	Infectious	6	2	No				
32	None		No		Yes	Yes	22-Mar-17	13	SCHELL OT	22-Mar-17	13.3	22-Mar-17	13.45	BBF splash	2	1	No	BUPIVACAINE	Anaesthetic i	INJECTING	Yes
33	None		No		Yes	Yes	22-Mar-17	13	OT	22-Mar-17	13	22-Mar-17	13	BBF splash	2	1	No	BUPIVACAINE	Anaesthetic i	INJECTING	Yes
34	None		No		Yes	Yes	23-Mar-17	9		24-Mar-17	9	24-Mar-17	9	Infectious	6	2	No				

Sheet1 Sheet2 Sheet3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
68	68	schell		staff	1	40216	Confirmed		2397841	47	m	2	attender		22		22	2	PM OFFICE	Non-clinical	Diabetes
69	69	schell		student	2				5843095	22	f	2	others	JRF	0.4		0	1	CSCR	Lab	Hypertei
70	70	schell		staff	1	20081	Confirmed		8979131	49	f	1	doc consultant		17		17	2	CHILD HEALTH	Clinical	None
71	71	schell		staff	1	40674	Confirmed		3333333	28	m	2	attender		6		6	1	ENVT ENGINEE	Non-clinical	None
72	72	sohs		staff	1	53745	Non-confirmed		2796050	24	m	2	technician		1.8		1	1	ANAESTHESIA	Clinical	None
73	73	schell		staff	1	98183	Confirmed		9888838	48	f	2	technician		27.4	2	29	2	ANAESTHESIA	Clinical	Diabetes
74	74	schell		staff	1	41479	Confirmed		9191316	46	f	2	sweeper		15		15	1	PULM MED	Clinical	None
75	75	schell		staff	1	42217	Confirmed		2457325	30	f	2	others	SECRETARY	8.1		8	1	OS OFFICE	Non-clinical	None
76	76	sohs		staff	1	42736	Confirmed		8138881	26	f	2	sweeper		6		6	1	NEUROLOGY	Clinical	None
77	77	schell		staff	1	52069	Confirmed		3640064	35	f	2	technician		10		10	1	PMR	Non-clinical	None
78	78	schell		staff	1	T1209	Non-confirmed		4979081	27	m	2	others	CLERK TYPIST	2.2		2	1	CHILD HEALTH	Non-clinical	None
79	79	sohs		staff	1	31464	Non-confirmed		8076206	27	f	1	doc pg		3		3	1	PATHOLOGY	Lab	None
80	80	schell		staff	1	74071	Confirmed		1710775	26	f	1	nurse medical		6	3.6	9	1	MHC	Clinical	None
81	81	sohs		staff	1	94077	Project		4842401	22	f	2	technician		2.8		2	1	CLIN HEMAT	Lab	None
82	82	sohs		staff	1	74016	Confirmed		5085087	30	f	1	nurse surgical		5.3		5	1	MAIN OR	Clinical	None
83	83	schell		staff	1		Non-confirmed		4880335	21	f	2	technician		3	2	2	1	ANAESTHESIA	Clinical	Others
84	84	schell		staff	1	78600	Non-confirmed		4521063	20	f	1	nurse surgical		1.6		2	1	CMC	Clinical	None
85	85	sohs		staff	1	83699	Project		5775035	32	m	2	others	ABE FELLOWS	0		0	1	Allamp.E	Clinical	None
86	86	schell		student	2				8487431	20	f	3	stu nursing			2	2	1	CON	Non-clinical	None
87	87	sohs		student	2				2909996	20	m	3	stu nursing			1.6	1	1	CON	Clinical	Bronchi
88	88	schell		staff	1	40248	Confirmed		8988091	50	f	2	attender		27		27	2	PHYSIOLOGY	Non-clinical	Others
89	89	schell		staff	1		Non-confirmed		1024661	25	f	1	doc intern		1		0	1	MBBS INTERN	Clinical	None
90	90	schell		staff	1		Confirmed		1111134	40	f	2	sweeper		28		0	1	PM OFFICE	Non-clinical	None
91	91	schell		staff	1	71221	Confirmed	9.8956E+09	2982768	40	f	1	nurse medical		18	3	0	1	OPHTHALMOLO	Clinical	None
92	92	sohs		staff	1		Non-confirmed		3253287	26	f	1	doc pg			1	0	1	GEN PATHOLO	Lab	None
93	93	sohs		staff	1		Non-confirmed		4818950	27	m	1	doc pg			1	0	1	GEN PATHOLO	Lab	None
94	94	sohs		staff	1	53237	Confirmed		3606164	27	m	2	technician		3	1	0	1	GEN PATHOLO	Lab	None
95	95	sohs		staff	1		Non-confirmed		4584750	28	m	1	doc pg			1	0	1	GEN PATHOLO	Lab	None
96																					



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
35	35	schell		staff	1	40680	Confirmed		5759045	43	m	1	attender		19		19	1	PM OFFICE	Non-clinical	None
36	36	sahs		staff	1	75422	Non-confirmed		4499035	30	f	1	nurse medical		2.5		2	1	HEPATOLOGY	Clinical	None
37	37	sahs		staff	1	72889	Confirmed		8297871	62	f	1	nurse surgical		11		11	1	SURGERY	Clinical	None
38	38	schell		staff	1	74610	Confirmed		5767436	35	m	1	others	CARPENTER	12		12	1	ENGINEERING	Non-clinical	None
39	39	schell		student	2				5779575	19	f	1	stu mbbs			1.5	1	1	MBBS	Non-clinical	None
40	40	sahs		student	2				8088960	21	f	1	stu dhs			2.5	2	1	CTS	Clinical	None
41	41	accident & emerg		staff	1	74607	Confirmed		8300160	36	f	1	nurse medical		7		7	1	CASUALTY	Clinical	Others
42	42	sahs		staff	1	42550	Confirmed		9976499	25	f	1	sweeper		6		6	1	MEDICAL WA	Clinical	None
43	43	schell		student	2				5778126	19	m	1	stu mbbs			2	2	1	MBBS	Non-clinical	None
44	43	schell		staff	1	75796	Non-confirmed		5252955	32	f	1	nurse medical		0.5		0	1	PULM MED	Clinical	None
45	45	schell		student	2				2509788	19	f	1	stu mbbs			1.5	1	1	MBBS	Non-clinical	None
46	46	schell		staff	1	41761	Confirmed		1324925	34	m	1	technician		10		10	1	CLIN PATHOLI	Lab	None
47	47	sahs		staff	1	75451	Non-confirmed		5733615	24	f	1	nurse medical		2	4	6	1	NURSING	Clinical	None
48	48	sahs		staff	1	41258	Non-confirmed		8588921	38	f	1	attender		18		18	1	OR	Clinical	None
49	49	sahs		staff	1	80945	Non-confirmed		9497186	22	f	1	technician		0.4	4	4	1	NUCLEAR MEI	Lab	None
50	50	sahs		staff	1	41414	Confirmed		5798135	40	f	1	sweeper		15		15	1	CSSN	Non-clinical	None
51	51	accident & emerg		staff	1	72829	Confirmed		3486271	37	f	1	nurse medical		10.5		10	1	CASUALTY	Clinical	None
52	52	sahs		staff	1	42026	Confirmed		2162215	31	m	1	others	ENGINEER	9		9	1	PMR	Non-clinical	Bronchia
53	53	schell		staff	1	51821	Confirmed		3588255	30	f	1	technician		10		12	1	RADIOLOGY	Lab	None
54	54	schell		staff	1	74123	Confirmed		2602223	31	f	1	nurse medical		7		7	1	CHILD HEALTI	Clinical	None
55	55	schell		staff	1	52345	Confirmed		5017515	32	f	1	technician		8.4		9	1	MDPHRD	Lab	None
56	56	schell		staff	1	80926	Confirmed		7499268	45	m	1	technician		20		20	1	RADIOLOGY	Lab	None
57	57	schell		staff	1	39486	Non-confirmed		2884653	36	f	1	doc pg		1.6	6	7	1	OPHTHALMOI	Clinical	None
58	58	sahs		staff	1	41790	Confirmed		5012675	31	m	1	sweeper		11		11	1	QI WARD	Clinical	None
59	59	sahs		staff	1	74692	Confirmed		2918795	32	f	1	nurse surgical		8.7		8	1	MAIN OR	Clinical	Bronchia
60	60	sahs		staff	1	39622	Non-confirmed		6645705	36	f	1	doc pg		3	3	3	1	ENT	Clinical	None
61	61	schell		staff	1	42533	Confirmed		5596655	28	f	1	sweeper		6		6	1	OPHTHALMOI	Clinical	Others
62	62	schell		staff	1	75761	Confirmed		9778884	30	f	1	nurse medical		8	3	11	1	NEONATOLOG	Clinical	None
63	63	schell		student	2				6882515	17	m	1	stu dhs			2	2	1	RADIOLOGY	Lab	None
64	64	schell		staff	1	70733	Confirmed		2260155	39	f	1	nurse medical		19	3	22	1	OPD SERVICES	Clinical	None
65	65	sahs		staff	1	76089	Confirmed		8878753	27	m	1	nurse medical		8.5	4	7	1	RADIOLOGY	Clinical	None
66	66	schell		staff	1	42187	Confirmed		3571535	28	m	1	technician		3		3	1	NS OFFICE	Non-clinical	None
67	67	schell		staff	1	75705	Confirmed		2197985	39	f	1	nurse surgical		9		9	1	CTS	Clinical	Diabetes
68	68	schell		staff	1	40324	Confirmed		2287645	47	m	1	attender		22		22	1	PM OFFICE	Non-clinical	Diabetes

Acronyms

A&E- Accident and Emergency

ADA -American Dental Association

AHS- Allied Health Services

AOR- Adjusted Odds Ratio

BBF- Blood and Body fluids

BDA-British Dental Association

CI- Confidence Interval

CMCH- Christian Medical College and Hospital

CMO- Chief Medical Officer

CHAD- Community Health and Development

DART- Days Away, Restricted, or Transferred

HBV- Hepatitis B Virus

HCV- Hepatitis C Virus

HCWs - Healthcare Workers

HCPs- Healthcare providers

HIV - Human Immunodeficiency Virus

ILO - International Labour Organization

IOP- Intraocular Pressure

IRB- Institutional Review Board

IQR- Inter Quartile Range

LCECU- Low Cost Effective Care Unit

NABH- National Accreditation Board for Hospitals and healthcare providers

OHS - Occupational Health Services

OPD- Out patient department

OR- Odds Ratio

OSH - Occupational and Safety Health

OSHA - Occupational Safety and Health Administration

OTS - Ocular Trauma Score

PEP- Post Exposure Prophylaxis

PI- Principal Investigator

PPE-Personal Protective Equipment

PG- Post Graduate

RR-Relative Risk

RUHSA- Rural Unit for Health and Social Affairs

SSHS- Staff, Students Health Services

SD- Standard Deviation

SE- Standard error

US – Unites States (of America)

WREI- Work Related Eye Injuries

WHO – World Health Organization