RISK OF CONJUCTIVAL CONTAMINATION FROM BLOOD AND BODY FLUID SPLASHES DURING SURGERY AT MUHIMBILI OPERATING THEATRES.

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Muhimbili University of Health and Allied Sciences

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By

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A dissertation submitted in partial fulfillment of the requirement for the award of the degree of Masters of Medicine (General Surgery) of the Muhimbili University of Health and Allied Sciences.

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CERTIFICATION

The Undersigned certifies that, he has read and hereby recommend for acceptance by Muhimbli University of Health and Allied Sciences a dissertation entitled: "**Risk of conjuctival contamination from blood/body fluid splashes during surgery at Muhimbili operating theatres** ".Submitted in partial fulfillment of requirement for degree of Master of Medicine in Surgery of Muhimbli University of Health and Allied Sciences

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Date 29/11/2010

DECLARATION AND COPYRIGHT

I, **Dr Ally Hamisi Mwanga,** do declare that this dissertation titled **Risk of conjuctival contamination from blood/body fluid splashes during surgery at Muhimbili Operating Theatres** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references. In addition I also declare that this work has not been submitted elsewhere for a similar or any other educational or non educational award and will not be presented in any other University or academic institution for a similar or any other academic award.

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Finally I am responsible for the contents and facts.

DEDICATION

This dissertation is dedicated to my family, my beloved wife Salma Abdallah Wibonella, our daughters Salha and Samra for their patience, understanding and moral support throughout the period I was studying and working on this dissertation as they missed my love and affection as a husband and father respectively.

ABSTRACT

INTRODUCTION

While most surgeons make an effort to avoid needlestick injury, some pay little attention to reduce the potential route of infection occurring when body fluids splash into the eye. It has been shown that transmission of HIV, Hepatitis B or C can occur across any mucous membrane.

OBJECTIVES

To determine the risk of conjuctival contamination with blood /body fluid splashes during surgery and to assess the utilization rate of protective eye gear at Muhimbili Operating Theatres.

DESIGN

Cross sectional, observational study

SETTINGS

The theatre suits of Muhimbili National Hospital and Muhimbili Orthopaedic Institute.

SUBJECTIVES

Surgeons and their assistants from all specialties utilizing the main theatres.

RESULTS

The contamination rate for provider protective eye wear was 50.52% with the mean droplets being 3.87, 2.79 and 1.57 per procedure for the primary surgeon, first assistant and second assistant respectively. The nature of surgery, professional rank, type of specialty, duration of procedure, role played during surgery and the use of powertools influenced the contamination rate. Utilization rate of protective eye gear was 30% The .most mentioned reasons for not using protective gears were that the later were uncomfortable, unavailable and misting.

CONCLUSION

The risk of conjuctival contamination was high (50.52%) and utilization rate of special design protective eye wear was low (16%), Changes in attitudes and practices are needed to increase utilization.

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LIST OF ABBREVIATIONS

HIV	Human immunodeficiency virus
HBV	Hepatitis B virus
HCV	Hepatitis C.virus
HCW	Health care worker
CDC	Communicable Disease Control
CSF	Cerebrospinal fluid
MNH	Muhimbili National Hospital
MOI	Muhimbili Orthopedic Institute
MUHAS	Muhimbili University of Health and Allied Sciences
OR	Odds Ratio
CI	Confidence Interval
OBS/GYN	Obstetric and Gynaecology
ENT	Ear Nose and Throat
OT	Orthopedic and Traumatology
NIMR	National Institute of Medical Research

1.0 INTRODUCTION AND LITERATURE REVIEW.

With immunodefiency virus(HIV) epidemic, occupational exposures to this virus is a cause of concern to all health workers, especially those working in the operating theatres in low income countries(1,2). The concern for occupational HIV infection has been increasing worldwide and especially in Sub Saharan African countries. In 2004, more than 40million people were living with HIV, two thirds (25.4m) were from Sub-Saharan Africa, which has only 10% of the total world population.(3, 4). These HIV infected people poses great risk of occupational HIV to Health Care Workers (HCWs).

Healthcare workers can be infected with HIV as a result of their work while handling HIV infected patients (occupational HIV exposures). Surgeons today are exposed to blood borne mucous membrane infections by pathogens as they perform their clinical activities in theatres and other work areas. Such infections include HIV, Hepatitis B virus (HBV) and Hepatitis C virus (HCV), to name but a few (5).

When HIV was described in 1981, attention was paid to HCWs safety in the operating room. In 1983, The Communicable Disease Control (CDC) recommended "caution" when handling body fluids from patient suspected of having AIDS. Initially HIV were considered to be rare and confined to a particular group at risk. This inaccurate notion changed rapidly as the disease reached epidemic proportion, and by 1987, the CDC recommended "universal precaution" which state that blood and body fluids precautions be used with all patients (6). In 1991, The Occupational Safety and Health Administration required use of Universal precautions with the enactment of the blood borne pathogen Standard (7). Unfortunately the published literature indicate that surgeons demonstrate poor compliance with universal precautions.(8).

It is speculated that a high prevalence of HIV will correspond to a high risk of conjuctival exposure and transmission of HIV in the HCWs. Universal precautions are needed when handling any patient regardless of serostatus (2, 9).

Compliance with universal precautions has been shown to reduce the risk of exposure to blood and body fluids. Studies have shown that wearing prescription glasses reduces chance of conjuctival contamination but not as effective as design specific eye goggles (5, 10).
An Indian study evaluating knowledge and understanding of universal precautions revealed that the understanding of universal precaution was partial, and universal precaution compliance was suboptimal. Only 32% of respondents wore eye protection when indicated, and 40% recapped needles at least sometimes (11).

Eye contamination through blood splashes can be significantly reduced by wearing prescription glasses and are completely eliminated in surgeons wearing more specialized goggles or full face shields (12).

Universal precautions and more recently standard precautions have been widely promoted in high in-come countries to protect HCWs from occupational exposures to blood and the consequent risk of infection with blood borne pathogens. In low in-come countries, the situation is slightly different, universal precautions are often practiced partially, if at all, thereby exposing the HCWs to risk of infections (13).

The skin or mucous membrane of operating room personnel may have contact with patients blood in as many as 50% of operations (reported range of 6.4-50%),(14, 15, 16, 17, 18).
While most surgeons make an effort to avoid needlestick injuries, some pay little attention to reduce the potential route of infection occurring when body fluid splash into the eye. It has been reported that transmission of HIV, HBV, and HCV can occur across any mucous membrane (14).

Any percutaneous or per-mucosal exposure to blood or body fluids represents a potential source of HIV infection (19).The average risk of HIV transmission after mucous membrane exposure is up to 0.1% (20, 21, 22, 23, 24).

All HCWs who come in contact with blood or body fluids of HIV-infected patients in the hospitals or laboratories are at risk for occupational exposure to HIV (25). Blood and body fluids are considered infectious. Potentially infectious body fluids include semen, vaginal secretions, CSF, pleural, peritoneal, pericardial and amniotic fluids. With the prevalence of HIV and hepatitis increasing, it seems prudent to protect oneself against possible route of transmission (26). HIV contamination has been reported in HCWs resulting from bodily fluids that splash into the eyes (27).

A prospective study conducted in 1993 at St Francis Hospital in Kitete, Zambia, indicated that the HIV seroconversion risk among surgeons in tropical Africa may be 15 times higher than in developed countries, This is because of the high prevalence of HIV in Africa (28).
Surgeons attended 2006 Pan-African Associations of Surgeons conference were surveyed and found that they sustained a mean of 4.1 exposures to blood/body fluid predominantly from blood splash to the eyes .

A study done by Gumodoka B et al in 1993 in 9 hospitals in Mwanza region to investigate the occupational exposure to HIV among HCWs showed an average of 5 pricks and 9 splashes per year to HCWs giving an annual occupational risk of HIV transmission of 0.27% to HCWs. Among surgeons the risk was 0.7% if no special protective measures were taken (29).
Recently there were 106 documented cases of HCWs who seroconverted following occupational HIV exposure and 238 cases of possible occupationally acquired infection worldwide by 2004 (30). Among the 106 documented cases, 53% were nurses/midwives, and only 14%of them were doctors. There are no reported cases of occupational HIV either from Tanzania or any other Sub-Saharan countries. This is most likely due to poor surveillance systems in these countries .

Factors influencing the risk of an individual HCW to acquire occupational HIV and hepatitis over a life time career includes the number and type of blood contact experienced by the

worker (cumulative life time risk), the prevalence of HIV infection among patients treated by a worker, and the risk of transmission of infection after a single blood contact (27, 31, 32,). The risk of mucous membrane exposure to blood and body fluids splash during surgery has been established at Muhimbili, nor national wide.

2.0 STATEMENT OF THE PROBLEM.

Occupational HIV infection is an area of considerable concern for many HCWs and it can be devastating for the person concerned.

A prospective study conducted in 1993 at St Francis hospital in Kitete, Zambia, indicated that the HIV seroconversion risk among surgeons in tropical Africa may be 15 times higher than in developed countries, this is because of high prevalence in Africa. Surgeons are at high risk of HIV while operating, and although most surgeons take precautions to avoid needle stick injury, few pay close attention to the potential route of infection that occurs when body fluids splashes into the eyes and faces (13).

With high prevalence of HIV in Tanzania, the prevalence of occupational HIV infection is expected to be high. Information is critically lacking regarding the incidence of blood splashes and the risk of occupational HIV exposure in our country, also the provision of the safety working environment by the employer as the policy on universal precaution is lacking.

This has led to laxity among surgeons and other HCWs in implementing the universal precaution policy, putting themselves at great risk.In Tanzania, little is published on blood exposures during surgery.Surveillance programs that provide in-depth analysis of blood and body fluids exposures are needed if at all we want to minimize the problem.

It is speculated that a high prevalence of HIV will correspond to a high risk of occupational exposure and transmission of HIV in the HCWs.

3.0 RATIONALE

Information is lacking about the incidence of mucous membrane exposure and the utilization rate of protective eye ware during surgery. This has led to laxity among surgeons and other HCWs in practicing universal precaution policy during operation.

A need for a study to investigate the magnitude of occupational exposure following blood and body fluids splashes is critical. The results of the study will create and raise awareness and therefore enable health care workers adhere to universal precautions versus HIV and other infectious diseases.

4.0 NULL HYPOTHESIS

There is no need for protective eye gear during surgery.

5.0 OBJECTIVES OF THE STUDY.

5.1 Broad objective

To determine the conjuctival contamination with blood/body fluid splashes and to assess the utilization rate of protective eye gear during surgery.

5.2 Specific objectives

1. To determine the incidence of blood/body fluid splashes to the eyes during surgery.
2. To determine the occurrence of blood/body fluid splashes to the eyes during surgery and the associated factors.
3. To assess the utilization rate of protective eye gear by surgeons during surgery.

6.0 METHODOLOGY

6.1 Study design.

This study was a hospital based cross sectional study.

6.2 Study area

This study was conducted at Muhimbili National Hospital (MNH) main theatre. Obstetric theatre (MNH) and Muhimbili Orthopaedic Institute (MOI) main theatre. The two institutions (MNH and MOI) are within the same compound and they are highly related in their day to day activities. Majority of Orthopaedic patients belonging to MOI shares wards with MNH patients, also cardiac surgery theatres which are under MNH are within MOI main theatre. It is through this close relationship between these institutions that majority of Tanzanian recognizes MOI as a unit of MNH. These tertiary institutions save as referral units for the Dar es Salaam municipalities and nearby regions and nationwide complicated cases as well as teaching hospitals for the Muhimbili University of Health and Allied Sciences (MUHAS).
They are located in the largest commercial city of Tanzania namely, Dar-es Salaam.
Dar-es-Salaam city located at 6° 48□'S and 39° 17 E is the largest city in Tanzania.

6.3 Study population

The study population consisted of all primary surgeons and their assistants utilizing the main theatres at MNH and MOI and who consented to participate in the study.

6.4 Study period

This was 11 months study which was conducted from May, 2009 to March, 2010.

6.5 Inclusion criteria

All participants (specialist, residents, registrars, intern doctors and medical students who were attached to surgical department and utilizing main theatres of MNH and MOI at the time of data collection.

6.6 Exclusion criteria

Those surgeons declining to take part in the study

Ophthalmological and Endoscopic procedures or minor procedures involving incisions less than 3cm in length (3).

6.7 Sample size

Sample size was calculated using the formula for cross-sectional study

$n=Z^2p\ (1-p)/e^2$

Where **n**=expected minimal sample

Z=standard, corresponding to 95% confidence, 1.96

P=incidence of splashes from previous studies, 50%

E=maximum likely error taken to be 5%

Therefore n was found to be **384** which represented number of spectacles examined.

6.8 Data collection procedures

The study enrolled 100 primary surgeons and their assistants utilizing MNH and MOI main theatres and Obstetric theatres during the period of data collection.. The protective eye goggles were examined after surgical procedures and participants (surgeons) had their goggles examined depending on the number of procedures performed, this indicates that most participants had their goggles examined more than once. Protective eye goggles (Wrap-around clear-lens glasses) with a side shield were provided to all participants. The examined spectacles were re-used by washing in-between surgeries.

At the end of each procedure all goggles provided were inspected and a record of blood and body fluid splash on the lens of the glasses was made. The lens was held in front of a plain white piece of paper to aid visualization of all blood and body fluid splash before and after all procedures. Visualization was aided by the use of magnifying loops with magnification of 15. The number of macroscopic blood splashes was determined. Total drop count from the two lenses (right and left), were taken as the level of contamination. Between operations lenses

were cleaned with an alcohol-soaked swab (Steret pre-injection swab: Seton Healthcare Group plc) to ensure lenses were clean before each procedure which was confirmed by examination using hand lens. Drop counts were done on the outside of the lens.

In the situation where the blood/body fluid was literally running down the goggles, this was classified as large irrespective of other splashes, and for the purpose of statistical analysis this type of splash was considered as 15 drops (5), however, this did not happen in my study. Data collection procedures were performed by the investigator himself with the help of three assistances, one assistant from each theatre. In the beginning, assistances were trained by the investigator and their understanding was checked.

Questionnaire was used to obtain factors that were possibly associated with the blood splashes like the professional ranks and specialties of surgeons, use of power tools, excessive irrigation, and awareness of splashes during the procedure.
Each participating surgeon was interviewed once on the protective eye gear utilization

6.9 Data Management and Analysis

The collected information was counterchecked by the investigator for completeness and quality and later entered into the SPSS database. The analysis was done using the same software. The descriptive statistics were computed, comparisons of continuous variables were done using appropriate parametric (mean, t-test) and non parametric tests (median, Mann-Whitney test). Comparison of proportion was done using chi2 tests.
Odds Ratio's (OR) were computed by using univariate logistic regression and multivariate logistic regression was done to control for confounding. The p-value of < 0.05 was considered significant

6.10 Data storage

The questionnaires from which the information were extracted are stored for easy retrieval whenever necessary.

6.11 Ethical issues

Ethical clearance was obtained from the directorate of research and publication at MUHAS. Permission to conduct the study was obtained from MNH and MOI administrations.

7.0 RESULTS

TABLE 1a GENERAL DESCRIPTION

Variable		Frequency	Percentage
Professional rank	Specialists	98	25.52
	Residents	141	36.72
	Registrars	71	18.49
	Intern Doctors	61	15.89
	Medical.Student	13	3.39
	Total	384	100
Role in the Procedure	Primary Surgeon	183	47.66
	First Assistants	145	37.76
	Second Assistants	56	14.58
	Total	384	100
Nature of Surgery	Elective Surgery	237	61.88
	Emergency Surgery	146	38.12
Type of Surgery	General Surgery	94	24.54
	Orthopedic Surgery	141	36.81
	Obs/Gyn Surgery	53	13.84
	Urological Surgery	20	5.22
	ENT Surgery	24	6.27
	Neurosurgery	20	5.22
	Paed. Surgery	11	2.87
	Maxillofacial Surgery	10	2.61
	Plastic Surgery	10	2.61
	Total	383	100
Aware of Splash	Yes	79	20.68
	No	303	79.32
	Total	383	100
Use of power tools	Yes	115	29.95
	No	269	70.05
	Total	384	100
Irrigation done	Yes	4	1.04
	No	380	98.96
Contamination	Yes	194	50.52
	No	190	49.48

TABLE 1b; SUMMARY OF DURATION VS OTHER VARIABLES

		Duration		
Variable		**Mean**	**Median**	**P-Value**
Nature of Surgery				
	Elective Surgery	119.39	105	
	Emergency Surgery	103.49	90	0.0025
Type of Surgery				
	General Surgery	118.88	120	
	Orthopedic Surgery	110.82	105	
	Obs/Gyn Surgery	65.28	60	
	Urological Surgery	88.25	90	
	ENT Surgery	78.96	50	
	Neurosurgery	254.25	240	
	Paed. Surgery	158.18	180	
	Maxillofacial Surgery	153	105	
	Plastic Surgery	114	82.5	
Use of power tools				
	Yes	116.39	105	
	No	111.86	90	
Irrigation done				
	Yes	78.75	75	
	No	113.58	105	0.1754
Contamination				
	Yes	119.33	105	
	No	106.97	90	0.0089
Aware of Splash				
	Yes	122.15	120	
	No	110.48	90	0.0138

From tables 1a, 1b.

A total of 384 splashes were observed. Residents and specialist formed the greater part of the study by 141(36.72%) and 98(25.52%) respectively..

Most examinations were done on primary surgeons 183(47.66%), first and second assistants contributed 145(37.76%) and 56(14.58%) respectively, with elective procedures forming the majority of studied events 237(61.88%) as compared to the emergency ones 146(38.12%).

Regarding the specialty, most examined events were from the discipline of Orthopedics 141(36.81%) with maxillofacial and plastic surgery contributing the least 10 observations each).

Blood/body fluids splashes were noticed intraoperatively on the lens of the protective glasses in only 79 events (20.68%).

Powertool were used only in orthopedic procedures and this was reported in 115(29.95%) times.

Just over half (50.52%) of the examined lenses were found to be contaminated with blood and body fluids after surgical procedure.

The observed mean duration for elective procedures was 119.39 and 103.49minutes for emergency procedures. Neurosurgical procedures were found to have the largest mean duration (254.5minutes) and the least mean duration were with Obs/Gyn procedures (65.28minutes).

TABLE 2: CONTAMINATION VS EXPOSURES

		CONTAMINATION				
VARIABLES		**No Contamination**	**Contamination**	**Total**	**P-Value**	**OR**
Nature of Surgery	Elective Surgery	129 (54.43)	108 (45.57)	237 (100)		1
	Emergency Surgery	60 (41.10)	86 (58.90)	146 (100)	0.007	1.71
	Total	189 (49.35)	194 (50.65)	383 (100)		
Type of Surgery	General Surgery	60 (63.83)	34 (36.17)	94 (100)		1
	Orthopedic Surgery	46 (32.62)	95 (67.38)	141 (100)		3.64
	Obs/Gyn Surgery	19 (35.85)	34 (64.15)	53 (100)		3.16
	Urological Surgery	15 (75.00)	5 (25.00)	20 (100)		0.59
	ENT Surgery	17 (70.83)	7 (29.17)	24 (100)	< 0.01	0.73
	Neurosurgery	10 (50.00)	10 (50.00)	20 (100)		1.76
	Paed. Surgery	8 (72.73)	3 (27.27)	11 (100)		0.66
	Maxillofacial Surgery	8 (80.00)	2 (20.00)	10 (100)		0.44
	Plastic Surgery	7 (70.00)	3 (30.00)	10 (100)		0.76
	Total	190 (49.61)	193 (50.39)	383 (100)		
Role in the Procedure	Primary Surgeons	76 (41.53)	107 (58.47)	183 (100)		4.66
	First Assistants	71 (48.97)	74 (51.03)	145 (100)	< 0.01	3.45
	Second Assistantss	43 (76.79)	13 (23.21)	56 (100)		1
	Total	190 (49.48)	194 (50.52)	384 (100)		
Profesional rank	Specialists	43 (43.88)	55 (56.12)	98 (100)		3.31
	Residents	52 (36.88)	89 (63.12)	141 (100)		4.43
	Registrars	38 (53.52)	33 (46.48)	71 (100)	< 0.01	2.25
	Intern Doctors	44 (72.13)	17 (27.87)	61 (100)		1
	Total	177 (47.71)	194 (52.29)	371 (100)		
Aware of Splash	Yes	0 (0.00)	79 (100)	79 (100)		
	No	189 (62.38)	114 (37.62)	303 (100)	< 0.01	
	Total	189 (49.48)	193 (50.52)	382 (100)		
Use of power tools	Yes	27 (23.48)	88 (76.52)	115 (100)		5.01
	No	163 (60.59)	106 (39.41)	269 (100)	< 0.01	1
	Total	190 (49.48)	194 (50.52	384 (100)		
Irrigation done	Yes	2 (50.00)	2 (50.00)	4 (100)		
	No	188 (49.47)	192 (50.53)	380 (100)	0.68	
	Total	**190 (49.48)**	**194 (50.52**	**384 (100)**		
Duration of Procedure	Short	80 (57.97)	58 (42.03)	138 (100)		1
	Medium	62 (45.26)	75 (54,74)	137 (100)	0.0089	1.67
	Long	48 (44.04)	61 (55.96)	109 (100)		1.76
	Total	190 (49.48)	194 (50.52	384 (100)		

From table 2;

Orthopaedic and OBS/Gyn departments were observed to have more blood/body fluids splashes 95 (67.38%) and 34(64.13%) respectively while maxillofacial specialty demonstrated the least contamination (20.0%).

The study has demonstrated that there is significantly more blood/body fluids splashes when operating on emergency basis 86(58.90%) as compared to when it is an elective procedure (45.57%), p=0.007

The primary surgeon was most susceptible to blood/body fluid splashes (58.47%). First and second assistants demonstrated 51.03 and 23.21% contamination respectively. Contamination with blood/body fluids splashes in relation to the operating team was found to be statistically significant ($p<0.01$)..

Residents demonstrated more contamination (63.12%) followed by specialists (56.12%), and the least contamination was with intern doctors (27.87%).

All participants who were aware of splashes intraoperatively (79), were also found to have splashes on their lenses. Among 303 participants who were not aware of splashes intraoperatively, 114 (37.62%) had splashes in their lens.

From this study 115 participants were involved in the procedures using powertools and majority of them 88 (76.52%) had blood/body fluid splashes in their lens compared to 27 (23.48%) who had no contamination and the difference was also to be statistically significant ($p<0.01$).

It was also noted that, the longer the length of the procedure the higher the incidence of blood/body fluid splashes. Among 138 surgeons involved in short duration procedures, 58 (42.03%) had splashes compared to 109 surgeons who participated in longer duration procedures with 61(55.96%) splashes. (p=0.0089).

TABLE 3; LEVEL OF CONTAMINATION.

		Drops			
Variable		**Median**	**Mean**	**Total**	**P Value**
Nature of Surgery	Elective Surgery	0	2.99	237	0.0746
	Emergency Surgery	2	3.34	146	
Type of Surgery	General Surgery	0	1.83	94	
	Orthopedic Surgery	6	4.96	141	
	Obs/Gyn Surgery	1	3	53	
	Urological Surgery	0	0.85	20	
	ENT Surgery	0	0.86	24	< 0.01
	Neurosurgery	0.5	4.45	20	
	Paediatric. Surgery	0	1.18	11	
	Maxillofacial Surgery	0	0.8	10	
	Plastic Surgery	0	1.22	10	
Role played	Primary Surgeons	2	3.87	182	
	First assistants	1	2.79	145	< 0.01
	Second Assistants	0	1.57	56	
Profesional Rank	Specialists	1	3.93	98	
	Residents	4	4.41	141	
	Registrars	0	2.66	71	< 0.01
	Intern Doctors	0	0.77	61	
	Medical Students	0	0	13	
Use of power tools	Yes	6	5.77	115	< 0.01
	No	0	1.99	269	
Irrigation done	Yes	4.5	4.5	4	
	No	1	3.1	380	0.5837
Aware of Splash	Yes	8	8.21	79	
	No	0	1.79	303	< 0.01

Table 3; Table showing number of surgeries for each variable and its correlation with mean level of drops.

From this study the mean number of drops per elective procedure were 2.99 and for emergency were 3.34, p=0.0746.

The mean number of drops per procedure for the discipline of Orthopaedics was 4.96, Obs/gyn 3 and neurosurgery 4.45 drops. The least mean drops per procedure was with maxillofacial (0.8), p<0.01.

The study has also demonstrated that the mean number of drops per procedure for the primary surgeon, first assistant and second assistants were 3.87, 2.79 and 1.57 drops respectively, p<0.01.

Residents demonstrated higher level of contaminations, mean drops of 4.41. The mean drops per procedure for the specialist, registrar, intern doctors and medical students were 3.93, 2.66, 0.77 and zero respectively, p<0.01.

There was a significant difference in the level of contamination as regarding to the use of powertool or not. Mean drops per procedure when using power tool was 5.77 and when no powertool use, the mean was 1.99, p<0.01.

The study also demonstrated that the level of contamination is higher (mean drops 8.21) when a member of the operating team is aware of contamination intraoperatively compared to mean drops of 1.79 per procedure when being unaware intraoperatively, p<0.01.

Table 4; Univariate and multivariate logistic regression of predictors of contamination

	Univariate analysis			Multivariate Analysis		
Variable	**OR**	**95% CI**	**P value**	**OR**	**95% CI**	**p value**
duration of surgery	1.27	1.06-1.53	0.011	1.006	1.001-1.01	**0.013**
nature of surgery	1.71	1.13-2.6	0.012	1.859	0.947-3.648	0.071
specialty	0.88	0.79-0.97	0.013	0.937	0.826-1.063	0.314
role played	1.87	1.39-2.51	<0.001	2.621	1.277-5.378	**0.009**
professional rank	0.61	0.51-0.75	<0.001	1.214	0.772-1.908	0.401
powertools	5.01	3.05-8.23	<0.001	2.847	1.23-6.58	**0.014**
Splash*						

From table 4 above.

From univariate logistic regression, thduration of surgery, nature of surgery, specialty, role played, professional rank and the use of powertools has shown the significant association with conjuctival contamination. However in multivariate analysis, duration of surgery, role played and the use of powertools were found to be the strongest predictor of conjuctival contamination, there p-values were 0.013, 0.009 and 0.014 respectively.

Intraoperative awareness of the splashes was the perfect predictor of the occurrence of conjuctival contamination.

Table 5; Eye gear utilization

Variables		sex		
		Male	**Female**	**Total**
Use of protective gear				
	No	58	12	70
	Yes	26	4	30
	Total	84	16	100
Type of gear	Prescription	12	2	14
	Special design	14	2	16
	Total	26	4	30
Reasons for not using				
	Unavailable	14	2	16
	Uncomfortable	18	4	22
	Misting	13	0	13
	Not important	3	0	3
	Forgot	3	3	6
	No reason	4	0	4
	Not routine	3	3	6
	Total	58	12	70

From table 5.

Of the 100 subjects interviewed, 84 were males and 16 females.

Utilization rate of protective eye gear was found to be 30%.

Of 30 participants who reported to be using protective gears, 14 use prescription eye glasses and 16 uses special design protective gear.

Most mentioned reasons for not using protective gears were, unavailable 16, feeling uncomfortable 22 and misting 13..

8.0 Discussion

Surgeons today are at risk of occupational exposures to blood borne pathogens, namely HIV, HBV and HCV. The risk is even much higher among surgeons working in regions with high prevalence of HIV like in our country. Most surgeons are more concerned about needleprick injuries and there is tendency among surgeons to ignore the potential route of infection transmission through the skin and mucous membrane. Therefore this study was conducted to establish exposure rates that a surgeon can encounter through blood/body fluid splashes during surgery and thereby establishing the need for the eyes protection.

The present study revealed that accidental blood and body fluid contamination during surgery constitutes a substantial problem for the operating team. This fact is evidenced by an overall 50.52% risk of blood/body fluid splashes on the protective spectacle lens during surgery. This finding agrees with previous studies where blood splash contamination recorded on spectacles and protective eye shields which varied from 25-51% (14, 15, 16, 17, 18). It was also found from this study that 37.62% of participants were unaware of the splashes taking place and only realized during the final goggles examination. This significant rate of intraoperative unawareness could be due to the fact that quite a number of procedures in this study had low level of contamination (mean drop per procedure of less than one) and therefore could not easily be noteced by the surgeon. There is also the possibility that some surgeons could not recall especially junior ones who direct most of their concentration on the procedure. In his study, Davis et al (21) showed that blood/body fluid splash was noticed intra-operatively on the lens of the protective glasses in 87 (50%) of cases.

Operating as a primary surgeon was observed to be associated with higher incidence of blood splashes while second assistants were least contaminated. This can be explained by the fact that by virtue of their positions and their role during operation. Most studied events in this study were Orthopedic ones where a surgeon operates just close to the site of operation(eg the limb) while the assistant might be a bit distant, situated deyond the contralateral limb. This

is also the case when performing mastectomy. This finding is in contrast from the one obtained by Davis et al (21) who revealed that the primary surgeon and their assistants were at equal risk of blood and body fluid splash to their eyes .The mean number of splashes observed per procedure was 3.87 drops for the primary surgeon and 2.79 and 1.57 for the first and second assistants respectively and these differences were statistically significant. This is higher than the result obtained from a similar study done by Ogendo et al (5) at Kenyatta National Hospital in 2008 which revealed the mean drops per procedure for the primary surgeon and the assistants to be 2.48 and 1.49 drops respectively.

Differences in the contamination rates were also observed between the different specialties. The discipline of Orthopedic and Obs/Gyn received the highest rates of contamination 67.38% and 64.15% respectively for the present study. The lowest rate was seen in the discipline of maxillofacial surgery (2 incidences). In essence, all specialties are at risk of contamination but the findings in this study were inconsistent. The low rate seen in maxillofacial surgery is probably due to fewer participants from this specialty and all procedures were elective. Orthopedic procedures were associated with more splashes possibly because most of these procedures are; performed with the assistance of powertools which enhances the splash of blood and bone particles, of longer duration and performed on emergency basis. All these factors have been shown to influence the occurrence and level of contaminations. In this study a significantly greater number of splashes were associated with the use of powertool, a common practice with orthopedic procedures. Per procedure a mean 5.8 and 1.8 drops were observed when powertool were used compared to when no powertool were used. The high mean drop contamination using powertool poses a significant risk to the operating team. Increased contamination has been reported to be associated with the use of powertools and irrigation (34, 35), and this generally is associated with Orthopedics surgery. From this study, the duration of surgery was found to have significant effect on the level of contamination. Longer procedures lead to fatigue and progressively decreasing level of concentration and therefore increasing the risk of contamination. Longer exposure to the risk will obviously increase the chances with time. Both incidences and the level of contamination

seem to increase with duration of procedure In this study. It was also shown that operating on an emergency basis poses more risk to contamination as compared to elective procedures, this is possible so because most emergencies are performed by junior surgeons (residents and registrars) with inadequate experience, performing many operations and taking longer time to operate.

The study has demonstrated that duration of procedure, role played during surgery and the uses of powertools are the strongest determinants (predictor) of the risk of conjuctival contaminations (multivariate logistic regression).

From this study, design specific eye protective gear utilization rate was found to be 16%, the rate in Kenya was found to be 6%. This difference is probably due to the small number of participants in this study. Other centers within the region reported slightly higher utilization rate amongst doctors ranging from 53-30.3% (13, 36, 37). Outside the region, in the United Kingdom, 48% of orthopedic surgeons interviewed in one study did not utilize eye protective equipment during orthopedic procedures, 28% even claiming eye protection was not necessary (39). In a Dutch study, up to 83% of respondents failed to use protective clothing (40).

In this study, it was observed that almost half of those reported to be using protective eye gear, were actually using prescription eye glasses. Eye contamination through blood splashes can be significantly reduced by wearing prescription eye glasses and are completely eliminated in surgeons wearing more specialized goggles or full face shields (12).Ordinary spectacles do provide a reasonable degree of protection, reducing the risk of contamination by a factor of ten (10). In the study, Though the use of prescription spectacles was significant in reducing contamination, the protection provided to the eyes is not an acceptable form of eye protection.

10. Conclusion

This study reveals beyond doubt that the risk of conjuctival contamination is significant and protective eye ware utilization is quite low. The author has reason to believe the situation in other facilities within the country is not any different from the findings at Muhimbili because most of the doctors else where in the country were trained at Muhimbili. The stronger predictors of conjuctival contamination were, the duration of procedure, the role played during surgery, the use of powertools and intraoperative awareness of splashes.

There is a need to enforce changes in attitudes and practices to avoid loss of manpower through blood born morbidity and possibly later mortality especially in this era of HIV/AIDS and Hepatitis.

11.0 Study limitation.

The study suffers a number of limitations

1. Not all splashes that appeared on the goggles necessarily would have fallen on the conjunctivae depending on their tangentry. Therefore this study may be an overestimation of the risk for conjuctival contamination.
2. This study determined the occurrence of splashes by the specialty type, this is too broad, it could be more informative had it been procedure specific.
3. The sample size was too small to be representative of the population.
4. Some surgeons were unwilling to participate.
5. This study was carried out as a dissertation for the award of Masters Degree and therefore it was limited with time. A study to determine the sero-conversion rate from blood/body fluid splashes to the eye would be most appropriate.

12.0 Recommendations.

The routine wearing of wrap-around protective glasses during all surgical operations is recommended in order to protect the surgeon/assistants against blood or body fluid contamination

Surgeons should be advised either to wear the goggles over/instead of their prescription glasses.

Improvement must be made to enhance understanding of the need for health workers to protect themselves inspite of the minimal discomfort; additionally employers should provide necessary equipments needed to achieve this.

Misting on the other hand is truly an issue with eye goggles, however with slight adjustment/warming of goggles this problem can be eliminated.

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