

Injury or body fluid splash incidence rate during three months period in elective surgery procedures, at Dicle University Hospital, Diyarbakır, Turkey

Dicle Üniversitesi Araştırma Hastanesi'nde üç aylık periyotta, elektif cerrahi işlemlerinde oluşan yaralanma ve kan-organ sıvısı sıçrama sıklığı çalışması

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BACKGROUND

In this study we aimed to determine the prevalence of sharp injuries (SI) and blood and body fluid (BBF) splashes in health care workers during elective surgery procedures (ESP). This study would help to plan the preventive measures for injuries and BBF splashes.

METHODS

All ESP were recorded during three months period and SI and BBF splashes were analyzed in Hospital of Dicle University. Hospital employees who reported SI or BBF splashes were interviewed about the types of devices causing injury and the circumstances of the injury.

RESULTS

During three months period, 1988 ESPs were recorded. SIs were reported in 111 procedures (5.6%) and BBF splashes were in 145 (7.3%). Incidence rate of SI was 2.8 per person year in teaching staff, 5.6 in residents, 6.3 in nurses and 1.5 for other health care workers. Incidence rate of BBF splashes was 14.5 per person year in trainers, 6.9 in residents, 8.4 in nurses, respectively. Duration of ESP, start time of ESP and number of employed personnel in the ESP were the factors that significantly influenced SI incidence. Duration of ESP and total person worked in ESP was effective on BBF splashes. SI was occurred in 14.4 of mandibulofacial, 12.2% of general surgery, 10.5% of chest surgery and 8.4% of brain surgery ESP. BBF splashes occurred in 14.4% of general surgery's, 13.5% of urology's, 14% of chest surgery's, 14.7% of cardiovascular surgery's ESP. The most frequently injured tissue was index finger (33.9%) and the pollex finger (31.4%).

CONCLUSION

SIs and BBFs are important health risks for health professionals who are involved in surgery, as it is in all other medical practices. SI and BBF splashes should be monitored and preventive measures should be planned urgently.

Key Words: Accidents, occupational; blood and body fluid; personnel, hospital; risk factors; sharp injuries.

AMAÇ

Bu çalışmada elektif cerrahi işlemler sırasında oluşan sivri cisim yaralanmaları (SCY) ve kan ve organ sıvısı (KOS) sıçramalarının sıklığının irdelenmesi amaçlandı. Bu çalışmanın, yaralanma ve KOS sıçramalarını engelleme çalışmalarına yardımcı olabileceği düşünüldü.

GEREÇ VE YÖNTEM

Dicle Üniversitesi Hastanesinde üç ay boyunca tüm elektif ameliyatlara kayıt edildi, SCY ve KOS sıçramaları analiz edildi. SCY ya da KOS sıçraması olarak bildirilen hastane çalışanlarıyla daha detaylı olarak görüşüldü ve yaralanma nedenleri detaylandırılmaya çalışıldı.

BULGULAR

Üç aylık sürede 1988 elektif ameliyat kayıt edildi. Bunların 111'inde (%5,6) SCY ve 145'inde (%7,3) KOS sıçraması bildirildi. Öğretim üyelerinde SCY insidansı 2,8 kişi-yıl olarak bulunurken, bu asistanlarda 5,6, hemşirelerde 6,3 ve diğer personelde 1,5 olarak saptandı. KOS sıçraması insidansı öğretim üyelerinde 14,5 kişi-yıl iken bu hız asistan ve hemşirelerde sırasıyla 6,9 ve 8,4 bulundu. Ameliyatın süresi, ameliyat başlama saati ve ameliyatta çalışan personel sayısı SCY oluşmasında etkili faktörler olduğu ve KOS sıçramasında da yine ameliyat süresi ve çalışan personel sayısının etkili olduğu saptandı. Çene cerrahisi ameliyatlarının %14,4'ünde, genel cerrahi ameliyatlarının %12,2'sinde, göğüs cerrahisinin %10,5'inde, beyin cerrahisinin %8,4'ünde SCY görüldü. Genel cerrahi ameliyatlarının %14,4'ünde, ürolojinin %13,5'inde, göğüs cerrahisinin %14'ünde, kalp damar cerrahisinin %14,7'sinde KOS sıçraması olduğu saptandı. En sık yaralanan organ işaret parmağı (%33,9) ve baş parmak (%31,4) oldu.

SONUÇ

Diğer tüm tıbbi uygulamalarda olduğu gibi elektif cerrahi işlemlerde de SCY ve KOS sıçramaları yaygın bir sorun olduğu gösterilmiştir.

Anahtar Sözcükler: Hastane çalışanları; kan-organ doku sıvısı sıçraması; kazalar, mesleki; risk faktörleri; sivri cisim yaralanması.

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Sharp injuries (SI) or Blood or Body Fluid (BBF) splashes sustained from an infected person pose the greatest occupational hazard for transmitting blood-borne pathogens to health-care workers.^[1,2] At present, many blood-borne viral infections cannot be prevented by pre-exposure vaccinations and an effective treatment for a complete cure is yet to be found. More than 20 pathogens have been transmitted through sharp or needle stick injuries.^[3] Although some existing types of blood-borne pathogens can be life threatening, new groups of pathogens previously unknown are constantly being discovered, adding to the risks of disease transmission through SI. Prevention of SI, therefore, plays an important role in reducing the risks of contacting blood-borne infections among health-care workers and trainers. There is still a serious lack of information about the various factors that cause accidents with needles. Surveillance programs that provide in-depth analysis of needle-stick accidents or BBF splashes are an important tool for obtaining information. To determine the rate of accidents and analyze the factors related with the accidents may play an important role in planning preventive measures. The aim of this study was to determine the incidence of SIs and BBF splashes in Dicle University Hospital in three months period.

We tried to describe the early results of our surveillance programme for accidents in EPS.

MATERIALS AND METHODS

At the time of study, 56 trainers, 134 residents, 26 nurses, and 20 paramedical staff were assigned in the Operation Hall. A standard report form was designed and descriptive information was obtained for each elective surgical procedure (ESP). During three months period, 1988 ESPs were recorded and sufficient information about SI and BBF splashes were supplied. Detailed information was obtained if an accident (SI or BBF splashes) occurred by using Incident Report Form (IRF). The detailed IRF included the following: a detailed written description of the event by the health care worker involved; a series of informative demographic questions and a section for comments of health care workers. The completed forms were collected by two injury control nurses (YD, UÇ) and checked by the director of Operation Hall. The collected data were coded and analyzed using EpiInfo-2000 (CDC-Atlanta, USA) to draw frequency tables and cross tabulations for descriptive statistics.

Definitions

Injuries: Wound caused by a sharp instrument that accidentally punctured the skin.

Splashes: Splashes of blood or body fluids (BBF) including blood, urine, amnion liquid etc. to skin or mucosal membranes.

Profession specific incidence rate: No of injuries or splashes arising in a certain working status/ person million minute at operation in that working status.

Statistical analyse: Frequencies and percentages were given in the Tables for description of the results. We used chi-square analyse to compare the groups. P values lesser than 0.05 was accepted as significance level. In some cases when frequencies in subgroups were lesser than 5, we used Fisher's exact test for evaluation of p value.

RESULTS

One hundred and eleven SIs (5.6%) of 1988 ESPs and 145 BBF splashes (7.3%) were reported during three months period. Two SIs and BBF splashes were occurred in 7 (0.3%) and 37 (1.9%) ESPs, respectively. Totally, 118 SIs and 182 BBF splashes were reported.

Profession specific SI and BBF splash incident rates were shown in Table 1. For all professions, incidence rate of injuries was 4.4 person-years and incidence rate of splashes was 6.8 person-years. The highest incidence rate was found to be in the nurses (6.3). Incidence rate of splashing body fluid was 14.5 person-years in the trainers and this rate were higher than others.

Some features of ESPs with SI or BBF splash were shown in the Table 2. There was no difference among days that SP took place by the means of injury or splash. Injuries were more frequently reported in ESP started between 08:00 and 10:59 ho-

Table 1. Profession specific injuries or splashes incidence rates (IR) person-year

Professions	Injury (IR)	Splash (IR)	Total
Trainer	14 (2.8) ^τ	61 (14.5) ^δ	73 (17.3)
Resident	59 (5.6) ^δ	72 (6.9) ^τ	131 (12.5)
Nurse	36 (6.3) ^δ	48 (8.4)	84 (14.7)
Other med. staff	9 (1.5)	–	9 (1.5)
Total	118 (4.4)	181 (6.8)	297 (11.2)

^τ difference between groups is not statistically significant (p>.05).

^δ difference between groups is statistically significant (p<.05).

Table 2. Different characteristics of elective surgical procedures (ESP) with SI or BBF splash

	n (%)	Injury	p	Splash	p
Day of SP					
Monday	374 (18.8)	13 (3.5)		27 (7.2)	
Tuesday	382 (19.2)	24 (6.3)		44 (11.5)	
Wednesday	409 (20.6)	24 (5.9)		24 (5.9)	
Thursday	395 (19.9)	25 (6.3)		34 (8.6)	
Friday	428 (21.5)	25 (5.8)	0.41	36 (8.4)	0.06
Start time of SP					
08.00-10.59	799	59 (7.4)		70 (8.8)	
11.00-13.59	777	42 (5.4)		60 (7.7)	
14.00-16.59	412	10 (2.4)	0.002	35 (8.5)	0.75
Duration of SP (min)					
less than 30	360	7 (1.9)		28 (7.8)	
30-90	874	37 (4.2)		67 (7.7)	
91-180	601	48 (8.0)		45 (7.5)	
more than 180	153	19 (12.4)	0.000	25 (16.3)	0.003
Total person worked in SP					
less than 5	484	15 (3.1)		31 (6.4)	
5-6	1155	59 (5.1)		67 (5.8)	
more than 6	349	37 (10.6)	0.000	67 (19.2)	0.000
<i>Total</i>	1988	111 (5.6)		145 (7.3)	

urs than other start time groups ($p=0.002$). But there was no difference among ESP start time by the means of splashes. Both injuries and splashes were more frequent in the ESP with longer duration ($p<0.001$ and 0.003). ESP with over 180 minute duration injury frequency was 12.4% and splash frequency was 16.3%.

The risk of having injury or splash was found higher in SP with higher total person ($p<0.001$ and $p<0.001$). The highest frequency of injury and

splashes was reported from clinic of general surgery ($p<0.001$ and $p<0.001$).

In Table 3 we compared SI and BBF splashes frequencies in general surgery clinic with other clinics. The most frequently injured finger were index finger and pollex (31.4% and 33.9%, respectively). Fifty-four injuries (45.8%) were caused by suture needles and 19 (16.1%) by scalpel. Most of the injuries occurred during suturation [44 (37.3%)] and incision [21 (17.8%)] (Table 4).

Table 3. Injuries and splashes according to different clinics

	n (%)	Injuries (%)	p^*	Splashes (%)	p^*
General surgery	361	44 (12.2)	–	52 (14.4)	–
Urology	192	4 (2.1)	0.00005	26 (13.5)	0.78
Pediatric surgery	180	2 (1.1)	0.00002	0 (–)	0.000**
Ophthalmology	214	10 (4.7)	0.002	3 (1.4)	0.000
Brain surgery	119	10 (8.4)	0.25	8 (6.7)	0.02
Chest surgery	57	6 (10.5)	0.71	10 (14.0)	0.53
Cardiovascular surgery	68	5 (7.4)	0.25	10 (14.7)	0.94
Orthopedics	263	13 (4.9)	0.001	21 (8.0)	0.013
Plastic and reconstructive	91	2 (2.2)	0.004	6 (6.6)	0.046
Oto-Rhino-Laryngology	164	8 (4.9)	0.009	11 (6.7)	0.011
Obstetrics and gynecology	272	6 (2.2)	0.0000	19 (7.0)	0.003
Maxillo-facial surgery	7	1 (14.4)	0.86	1 (14.3)	0.73**

* p values calculated by general surgery versus others; ** Fishers exact test.

Table 4. Different features of injuries or splashes

Injuries (n=118)	n (%)	Splashes (n=182)	n (%)
Injured organs		Splashed organs	
Pollex	37 (31.4)	Face	14 (7.7)
Index finger	40 (33.9)	Eyes	43 (23.6)
Palmar	20 (16.9)	Face and eyes	89 (48.9)
Other fingers	13 (11.0)	Mouth	8 (4.4)
Other organs	8 (6.8)	Others	28 (15.4)
Injuring equipment		Splashing fluid	
Scalpel	19 (16.1)	Blood	112 (61.5)
Suture needle	54 (45.8)	Urine	20 (11.0)
Ampule	11 (9.3)	Tissue fluid	18 (9.9)
Needle of injector	9 (7.6)	Others	32 (17.6)
Others	25 (21.2)		
When the injuries occurred?		When the splashes occurred?	
Incision	21 (17.8)	Incision	66 (36.3)
Opening ampule	11 (9.3)	Suturing	11 (6.1)
Suturing	44 (37.3)	Performing Foley catheter	8 (4.4)
Laparoscopy	4 (3.4)	Laparoscopy	15 (8.2)
Coterization	9 (7.6)	Performing thoracic tube	4 (2.2)
Washing sharp equipment	4 (3.4)	Coterization	5 (2.7)
Taking/giving sharp equipment	4 (3.4)	Washing sharp equipment	27 (14.9)
Preparing patient	9 (7.6)	Performing prosthesis	9 (5.0)
Anesthesia	5 (4.2)	Anesthesia	2 (1.1)
Others	7 (5.9)	Tumor extraction	3 (1.6)
		During birth	6 (3.3)
		Kidney extraction	3 (1.6)
		Endoscopy	13 (7.2)
		Performing intestinal anastomosis	1 (0.5)
		Performing T-tube	2 (1.1)
		Washing abdomen	2 (1.1)
		Others	5 (2.7)

Nineteen injuries (16.1%), and 8 splashes (4.4%) were occurred due to other contributing personnel.

The majority of injured staff (90.6%) had experience of accidents before this event (Table 5). Most of the accidents (44.1%) occurred to residents. More than half of the accidents were occurred in the health workers aged between 25-34 years and one third of them occurred in the staff with over 6 years working experience. Three of fourth of accidents were occurred in the staff with long duration of work.

DISCUSSION

In this study, SIs and BBF splashes were surveyed and it was shown that those injuries had high frequency. Five point six percent of SIs and 7.3% of BBF splashes of the 1988 SPs were reported and those frequencies were similar to those reported in

the literature.^[4,5] In our study, we investigated only elective surgical procedures so this may lead lower frequencies. Emergency surgeries may consist of higher risk of injuries. However, our findings showed that health workers were in great risk of owing to blood spreading diseases.

The highest risk of injuries was reported in nurses, it was reported that 25% of those working in operating theaters had pricked themselves in the previous month.^[6] And there were other reports that mentioned nurses had higher risks of injuries in surgical procedures.^[7,8] In our study, incidence of injury was 6.3 in nurses and this rate was higher than other professionals. Blood and body fluid exposure was defined among employees of a large tertiary medical center and annual rate of blood and body fluid exposure was 5.5.^[9] In our study, incidence of splashes of

Table 5. Different features of health workers injured or splashed with body fluids (n=297*)

	n (%)
Experience of having any kind of injuries or body fluid splashes	
Yes	269 (90.6)
No	28 (9.4)
Working status (professions)	
Teaching staff	73 (24.6)
Resident	131 (44.1)
Nurse	84 (28.3)
Other	9 (3.0)
Ages (years)	
Less than 25	34 (11.5)
25-34	194 (65.3)
35-44	52 (17.5)
Over 44	17 (5.7)
Working experience (years)	
Less than 2	50 (16.8)
2-4	108 (36.4)
4-6	50 (16.8)
Over 6	89 (30.0)
Working period (hours)	
Less than 2	14 (4.7)
2-4	52 (17.5)
5-8	189 (63.6)
8-12	30 (10.1)
More than 12	12 (4.0)

* In 3 cases both splash and injury were occurred in the same person.

blood or body fluid was 6.8 and in the trainers the risk was a little bit higher than other medical staff.

We tried to analyze the surgical procedures with injuries of health staff according to day of a week, time of the SP, duration of SP and total personnel occupied in SP. Duration of the SP and total personnel occupied in the SP were the indicators showing us this SP was more extreme and requiring hard working. In our study, there was a significant relation between injury or splashes with duration of the SP and total personnel occupied in the SP. However, in a study from Saudi Arabia it was reported that most of the injuries were occurred in the first half of the shift during day time.^[10]

In most of the studies, injury risk of health workers in surgical clinics was compared with internal medicine clinics.^[5,11] In our study, we tried to analyze the risk among different surgical clinics. It is complex to describe the causes of health workers'

injuries. In our study, we found that SI or BBF splash incidence rates were higher in general surgery, chest, brain and cardiovascular surgery than ophthalmology, pediatric surgery, plastic and reconstructive surgery, urology, otorhinolaryngology and obstetrics and gynecology.

An important result of this study, 16.1% of injuries and 4.4% of BBF splashes were occurred due to other contributing personnel. It was reported that needle transfer between two persons was a cause of injuries.^[12] In other study, one fifth of the injuries happened due to other contributing personnel.^[13] To avoid the health workers' injuries education of all persons occupied in SP should be suggested. While the suture needle and scalpel injuries were the leading causes of injuries in elective surgery. Finger injuries were the most frequently occurring events. In many other studies injector needles were the leading causes of injuries,^[14] but in our study we investigated elective surgeries and injection was rare application. In elective surgery, the injuries were different from the other medical procedures. Scalpels, suture needles, cauteries were the leading causes. But to wash the operation instruments and hurry in following operation were other causes of injuries which were specific to elective or emergent surgery. We recorded wide range of causes of injuries or BBF splashes in elective SP. Suturing and incision process were the leading causes of injuries and washing the surgical instruments was the leading causes of BBF splashing. However, many other applications had risk of injury or BBF splashes.

The data showed us that 90.6% of the health workers had experience of injuries or BBF splashes. Adegboye et al.,^[5] also reported high injury experience in health workers. In logistic regression, three variables emerged as being significantly and independently linked to reporting all occupational exposure to blood: younger age; having had at least one percutaneous injury (excluding splashes) and having lower susceptibility to boredom.^[15] Some measures like avoiding recapping injectors were found effective on injury prevention.^[16] However, our study object was elective surgery procedures and injections were rarely causing injuries. Preventive measures are more complex in elective surgery procedures. In our study, most of the events happened in residents during elective SP. In other reports nurses and inexperienced interns were in higher risk

but all reports were not specific to elective surgery.^[17] Residents may pose a higher risk in medical teaching hospital because residents taking risk for learning much. In other medical teaching hospital, it was reported that interns suffered more needle stick injuries than any other occupational group.^[18] Like in many other studies,^[9,19] health workers with short employee duration had higher rate of injuries or BBF splashes. It is unknown whether it was caused by working experience and knowing how to avoid from injuries or it was a result of less working time of experienced workers. Daily working period was another factor influencing injuries or BBF splashes in health workers. In our study, 63.6% of the events occurred in 5th and 8th hours of their working period. Few of the events occurred before that time but this has showed that risk was not zero.

The SIs and BBF splashes were frequently occurring events that pose great health risk for health professionals also in elective surgery. Duration of SP and total personnel occupied in SP were the factors increasing the injury frequency. The injury frequency was highest in general surgery. Most of the workers occupied in elective surgery had a previous history of injury. Preventive measures including surveillance of injuries should be urgently planned and applied in all surgical procedures.

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