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 sikliği çalışması

Melikşah ERTEM,1 Yasemin DALAR,2 Uğur ÇEVİK,2 Hayrettin ŞAHİN2

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 çi- sim yaralanımları (SCY) ve kan ve organ sıvısı (KOS) sıçramalarının sikliği ancak串联maşı girişimde, bu çalışmamızın, yaralanma ve KOS sıçramalarını engelleme çalışmalara yarılmar, olabilecektir düşünüldü.

GEREÇ VE YÖNTEM
Dicle Üniversitesi Hastanesi’nde üç ay boyunca tüm elektif ameliyatlar kayıt edildi, SCY ve KOS sıçramaları analiz edildi. SCY da KOS sıçraması olarak bildirilen hastane çalışanlarıyla daha detaylı olarak görüşildi ve yaralanma nedenleri detay-landırmaya çalışıldı.

BULGULAR
Üç ay süresince 1988 elektif ameliyat kayıt edildi. Bunların 111’inde (%5,6) SCY ve 145’inde (%7,3) KOS sıçraması bildirildi. Öğretim üyeslerinde SCY insidansı 2,8 kişi-yıl olarak bulunurken, bu asistanlarda 5,6, hemşirelerde 6,3 ve diğer personele 1,5 olarak saptandı. KOS sıçraması insidansı öğretim üyeslerinde 14,5 kişi-yıl ıken bu hız asistan ve hemşirelerde sırasıyla 6,9 ve 8,4 bulundu. Ameliyatın süresi, ameliyat başlama saati ve ameliyatı çalışan personel sayısı SCY oluşumunda et- kili faktörler olduğu ve KOS sıçramasında da yine ameliyat sü- resi ve çalışan personel sayısı etkili olduğu saptandı. Çe- nelerin ameliyatlarının %14,4’ünde, genel cerrahi ameliyatla- rının %12,2’sinde, göğüs cerrahisinin %10,5’inde, beyin cerra- hisinin %8,4’ünde SCY görülü. Genel cerrahi ameliyatlarının %14,4’ünde, ürolojinin %13,5’inde, göğüs cerrahisinin %14’ünde, kalp damar cerrahisinin %14,7’sinde KOS sıçrama- si olduğu saptandı. En sık yaralanan organ ise ter parmağı (%3,3) ve baş parmak (%3,4) oldu.

SONUÇ
Diğer tüm tibbi uygulamaları olduğu gibi elektif cerrahi işlemlerde de SCY ve KOS sıçramaları yaygın bir sorun olduğu göstermiştir.

Anahtar Sözcüklər: Hastane çalışanları; kan-organ doku sıvısı sıca- ması; kazalar, mesleki; risk faktörleri; sivri çism yaralanması.
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, UC) and checked by the director of Operation Hall. The collected data were coded and analyzed using EpInfo-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

<table>
<thead>
<tr>
<th>Professions</th>
<th>Injury (IR)</th>
<th>Splash (IR)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trainer</td>
<td>14 (2.8)†</td>
<td>61 (14.5)§</td>
<td>73 (17.3)</td>
</tr>
<tr>
<td>Resident</td>
<td>59 (5.6)§</td>
<td>72 (6.9)§</td>
<td>131 (12.5)</td>
</tr>
<tr>
<td>Nurse</td>
<td>36 (6.3)§</td>
<td>48 (8.4)</td>
<td>84 (14.7)</td>
</tr>
<tr>
<td>Other med. staff</td>
<td>9 (1.5)</td>
<td>–</td>
<td>9 (1.5)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>118 (4.4)</strong></td>
<td><strong>181 (6.8)</strong></td>
<td><strong>297 (11.2)</strong></td>
</tr>
</tbody>
</table>

† difference between groups is not statistically significant (p>0.05).
§ difference between groups is statistically significant (p<0.05).

Clif - Vol. 14 Sayı - No. 1

41
Table 2. Different characteristics of elective surgical procedures (ESP) with SI or BBF splash

<table>
<thead>
<tr>
<th>Day of SP</th>
<th>n (%)</th>
<th>Injury (%)</th>
<th>p</th>
<th>Splash (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>374 (18.8)</td>
<td>13 (3.5)</td>
<td></td>
<td>27 (7.2)</td>
<td></td>
</tr>
<tr>
<td>Tuesday</td>
<td>382 (19.2)</td>
<td>24 (6.3)</td>
<td></td>
<td>44 (11.5)</td>
<td></td>
</tr>
<tr>
<td>Wednesday</td>
<td>409 (20.6)</td>
<td>24 (5.9)</td>
<td></td>
<td>24 (5.9)</td>
<td></td>
</tr>
<tr>
<td>Thursday</td>
<td>395 (19.9)</td>
<td>25 (6.3)</td>
<td></td>
<td>34 (8.6)</td>
<td></td>
</tr>
<tr>
<td>Friday</td>
<td>428 (21.5)</td>
<td>25 (5.8)</td>
<td>0.41</td>
<td>36 (8.4)</td>
<td>0.06</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Start time of SP</th>
<th>n (%)</th>
<th>Injury (%)</th>
<th>p</th>
<th>Splash (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>08.00-10.59</td>
<td>799 (7.4)</td>
<td>59 (1.9)</td>
<td></td>
<td>70 (8.8)</td>
<td></td>
</tr>
<tr>
<td>11.00-13.59</td>
<td>777 (5.4)</td>
<td>42 (2.4)</td>
<td>0.002</td>
<td>60 (7.7)</td>
<td></td>
</tr>
<tr>
<td>14.00-16.59</td>
<td>412 (8.0)</td>
<td>10 (2.4)</td>
<td></td>
<td>35 (8.5)</td>
<td>0.75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duration of SP (min)</th>
<th>n (%)</th>
<th>Injury (%)</th>
<th>p</th>
<th>Splash (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 30</td>
<td>360 (7.9)</td>
<td>7 (1.9)</td>
<td></td>
<td>28 (7.8)</td>
<td></td>
</tr>
<tr>
<td>30-90</td>
<td>874 (4.2)</td>
<td>37 (8.0)</td>
<td></td>
<td>67 (7.7)</td>
<td></td>
</tr>
<tr>
<td>91-180</td>
<td>601 (8.0)</td>
<td>48 (8.0)</td>
<td></td>
<td>45 (7.5)</td>
<td></td>
</tr>
<tr>
<td>more than 180</td>
<td>153 (12.4)</td>
<td>19 (2.4)</td>
<td>0.000</td>
<td>25 (16.3)</td>
<td>0.003</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total person worked in SP</th>
<th>n (%)</th>
<th>Injury (%)</th>
<th>p</th>
<th>Splash (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 5</td>
<td>484 (3.1)</td>
<td>15 (3.1)</td>
<td></td>
<td>31 (6.4)</td>
<td></td>
</tr>
<tr>
<td>5-6</td>
<td>1155 (5.1)</td>
<td>59 (5.1)</td>
<td></td>
<td>67 (5.8)</td>
<td></td>
</tr>
<tr>
<td>more than 6</td>
<td>349 (10.6)</td>
<td>37 (10.6)</td>
<td>0.000</td>
<td>67 (19.2)</td>
<td>0.000</td>
</tr>
<tr>
<td>Total</td>
<td>1988 (5.6)</td>
<td>111 (5.6)</td>
<td></td>
<td>145 (7.3)</td>
<td></td>
</tr>
</tbody>
</table>

An analysis of the data shows that injury and splash rates were lower on Mondays 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

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

* p values calculated by general surgery versus others; ** Fishers exact test.
Injury or body fluid splash incidence rate during three months period in elective surgery procedures

Table 4. Different features of injuries or splashes

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

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 forth of accidents we’re 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. 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. And there were other reports that mentioned nurses had higher risks of injuries in surgical procedures. 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. In our study, incidence of splashes of
Table 5. Different features of health workers injured or splashed with body fluids (n=297)

<table>
<thead>
<tr>
<th>Experience of having any kind of injuries or body fluid splashes</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>269 (90.6)</td>
</tr>
<tr>
<td>No</td>
<td>28 (9.4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Working status (professions)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching staff</td>
<td>73 (24.6)</td>
</tr>
<tr>
<td>Resident</td>
<td>131 (44.1)</td>
</tr>
<tr>
<td>Nurse</td>
<td>84 (28.3)</td>
</tr>
<tr>
<td>Other</td>
<td>9 (3.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ages (years)</th>
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</thead>
<tbody>
<tr>
<td>Less than 25</td>
<td>34 (11.5)</td>
</tr>
<tr>
<td>25-34</td>
<td>194 (65.3)</td>
</tr>
<tr>
<td>35-44</td>
<td>52 (17.5)</td>
</tr>
<tr>
<td>Over 44</td>
<td>17 (5.7)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Working experience (years)</th>
<th></th>
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<tbody>
<tr>
<td>Less than 2</td>
<td>50 (16.8)</td>
</tr>
<tr>
<td>2-4</td>
<td>108 (36.4)</td>
</tr>
<tr>
<td>4-6</td>
<td>50 (16.8)</td>
</tr>
<tr>
<td>Over 6</td>
<td>89 (30.0)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Working period (hours)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 2</td>
<td>14 (4.7)</td>
</tr>
<tr>
<td>2-4</td>
<td>52 (17.5)</td>
</tr>
<tr>
<td>5-8</td>
<td>189 (63.6)</td>
</tr>
<tr>
<td>8-12</td>
<td>30 (10.1)</td>
</tr>
<tr>
<td>More than 12</td>
<td>12 (4.0)</td>
</tr>
</tbody>
</table>

* 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.\(^{[6,11]}\) 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. Adegbey 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. 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. Like in many other studies, 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 SIIs 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.

REFERENCES