

Occupational injuries among pediatric orthopedic surgeons

How serious is the problem?

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Abstract

In this cross-sectional study, we surveyed all pediatric orthopedic surgeons in Saudi Arabia using an anonymous electronic questionnaire composed of 23 items to identify the rate of occupational injuries and obtain other relevant information. Thirty-nine participants completed the questionnaire (response rate: 83%). Participants who sustained occupational injuries throughout their careers represented 82.5%. The most injured areas were the hands, eyes, and back by 54.5%, 24.2%, and 15.2%, respectively. Approximately 11.1% were injured while operating on infected patients. Approximately 30.3% reported their injuries to their institution. We concluded that the rate of occupational injuries among pediatric orthopedic surgeons is very high and underreported.

Abbreviations: HBV = hepatitis B virus, HCV = hepatitis C virus, HIV = human immunodeficiency virus.

Keywords: back pain, blood splash, occupational injury, pediatric orthopedics, sharp, surgeons

1. Introduction

Health care workers, as in any other profession, are exposed to occupational injuries regardless of their level or specialty.^[1,2] The prevalence of work-related injuries ranges from 34.6% to 81.5% among health personnel.^[3,4] Although the hand, eyes, and lower back are the most susceptible areas, such injuries can affect any part of the body.^[5,6] The occupational injuries can be related but not limited to the sharp instruments, blood splashes, radiation, and chemical materials.^[1,7] Sometimes, the consequences of these injuries, which may go unnoticed, are catastrophic.^[8,9]

In terms of economy, occupational injuries sustained in hospitals are ranked as the third most expensive injuries out of 313 industries costing over 3 billion dollar annually in the United States.^[10] These expenses are related directly to the

medical services provided to the injured individuals and indirectly through the loss of productivity.^[5]

Orthopedic surgery, which is highly demanding physically and mentally, is associated with high risks of occupational injuries. It is estimated that 44% of orthopedic surgeons sustained one or more occupational injuries despite the presence of universal precautions to avoid injuries caused by potential hazards.^[5] Most articles about orthopedic occupational injuries targeted staff surgeons from different subspecialties. However, studies discussing the rate among pediatric orthopedic surgeons specifically are limited. Furthermore, data that address the prevalence of occupational injuries in a middle eastern country such as Saudi Arabia are even scarcer.^[5,7,11]

This paper presents the prevalence and types of occupational injuries among pediatric orthopedic surgeons who have been still practicing in Saudi Arabia. It additionally provides details about the impact of their injuries, if present, along with other relevant information.

2. Materials and methods

After an extensive review of the literature,^[2,5-7] an anonymous electronic questionnaire composed of 23 items was developed. The first 3 questions were about the participants' demographics, including the age, sex, and sector of participant's institution (e.g., governmental or private). Another 4 questions inquired about the years of experience, hours of work per week, hours of performing surgery per week, and average daily hours of sleep. The section about occupational injury was composed of 5 questions covering multiple aspects. The first question in that section was about the number of injuries; uninjured participants were instructed to write zero. The other questions inquired about the injured area, cause of injury, setting (e.g., elective or emergency), and about any special circumstances that could carry a potentially significant risk at the time of injury like operating on an infected patient. The next section in the questionnaire was about the consequences of occupational injuries and their effect on the individual's performance. Such consequences were covered in

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5 questions investigating the chronicity of injury, pain characteristics, degree of limitation, any missing days of work following injury, and whether the respondents received medical care. Additional 5 questions inquired about the surgeons if they report occupational injuries to their institutions, most important institutional resources that meet the recovery needs of injured surgeons, degree of accessibility to such resources, whether the participant was educated about practicing protective measures, and the kind of education they received. The last question assessed the participants' experience about the presence of any association between operating with colleagues and the number of occupational injuries.

The targeted population was all board certified pediatric orthopedic surgeons practicing in the Kingdom of Saudi Arabia during the period of data collection (October 2016). Following the institutional review board approval at King Saud University, the names of hospitals and surgeons were retrieved from the updated databases of the Saudi Orthopedic Association and Saudi Ministry of Health. Orthopedic surgeons from subspecialties other than pediatric orthopedics were excluded.

The electronic questionnaire was emailed to all surgeons. An introduction about the questionnaire, objectives, confidentiality, and consent was included. A link was provided for those who were willing to participate.

The collected data were entered in an SPSS dataset. The IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp., Armonk, NY) was utilized for statistical analysis. The frequencies and percentages were obtained for all variables. Each answer in the multiple response questions was converted into a dichotomous variable and then all the variables related to each question were defined in a multiple response set. The internal consistency of the

construct was tested using Cronbach α . $P < .05$ was considered statistically significant.

3. Results

Thirty-nine participants completed the questionnaire (response rate: 83%). The mean age was 44.9 years and the range was from 33 to 64 years. The majority were males (97.5%). Most respondents were working in governmental hospitals (57.5%), while the remainders were either employed in private hospitals (10%) or working in both (32.5%).

Table 1 demonstrates the rate and number of occupational injuries among pediatric orthopedic surgeons based on the age group, years of experience, surgery hours per week, working hours per week, and hours of daily sleep.

The Cronbach α test revealed an α coefficient of 0.756 for the questionnaire items.

Participants who sustained occupational injuries throughout their careers represented 82.5%.

The most injured areas were the hands, eyes, and back by 54.5%, 24.2%, and 15.2%, respectively. The hand injuries were due to direct trauma from sharp objects. Blood splash to the eyes were the reported cause of eye injuries by 88.9%, while the remainder sustained direct injuries to the eyes from metal objects. The causes of back injuries were chronic and indirect such as muscle strain (63.3%) and vertebral disc pathology (36.7%).

The majority (66.7%) sustained most of their injuries during elective surgeries; the rest had most of their injuries while operating on emergency cases. Approximately 11.1% were injured while performing surgery on infected patients.

Table 1

The rate and number of occupational injuries among pediatric orthopedic surgeons based on the age group, years of experience, surgery hours per week, working hours per week, and hours of daily sleep.

Variable	Injured N (%)	Noninjured N (%)	How many injuries?				
			Zero injuries N (%)	1–3 Injuries N (%)	4–6 Injuries N (%)	7–10 Injuries N (%)	>10 Injuries N (%)
Age group							
30–39	9 (23.1)	2 (5.1)	2 (5.1)	4 (10.3)	5 (12.8)	0 (0.0)	0 (0.0)
40–49	17 (43.6)	2 (5.1)	2 (5.1)	6 (15.4)	8 (20.5)	2 (5.1)	1 (2.6)
50–59	4 (10.3)	1 (2.6)	1 (2.6)	1 (2.6)	1 (2.6)	0 (0.0)	2 (5.1)
>59	3 (7.7)	1 (2.6)	1 (2.6)	2 (5.1)	1 (2.6)	0 (0.0)	0 (0.0)
Years of performing surgery							
<10	6 (15.4)	1 (2.6)	1 (2.6)	4 (10.3)	2 (5.1)	0 (0.0)	0 (0.0)
10–20	15 (38.5)	3 (7.7)	3 (7.7)	5 (12.8)	8 (20.5)	2 (5.1)	0 (0.0)
21–30	8 (20.5)	0 (0.0)	0 (0.0)	2 (5.1)	4 (10.3)	0 (0.0)	2 (5.1)
>30	4 (10.3)	2 (5.1)	2 (5.1)	2 (5.1)	1 (2.6)	0 (0.0)	1 (2.6)
Hours of surgery per week							
<10	11 (28.2)	2 (5.1)	2 (5.1)	4 (10.3)	4 (10.3)	2 (5.1)	1 (2.6)
10–20	18 (46.2)	4 (10.3)	4 (10.3)	7 (17.9)	10 (25.6)	0 (0.0)	1 (2.6)
21–30	4 (10.3)	0 (0.0)	0 (0.0)	2 (5.1)	1 (2.6)	0 (0.0)	1 (2.6)
>30	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Working hours per week							
20–39	2 (5.1)	1 (2.6)	1 (2.6)	0 (0.0)	0 (0.0)	1 (2.6)	1 (2.6)
40–59	24 (61.5)	2 (5.1)	2 (5.1)	11 (28.2)	11 (28.2)	1 (2.6)	1 (2.6)
60–89	7 (17.9)	3 (7.7)	3 (7.7)	2 (5.1)	4 (10.3)	0 (0.0)	1 (2.6)
Hours of sleep per day							
<3	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
3–5	5 (12.8)	1 (2.6)	1 (2.6)	1 (2.6)	3 (7.7)	1 (2.6)	0 (0.0)
6–8	28 (71.8)	5 (12.8)	5 (12.8)	12 (30.8)	12 (30.8)	1 (2.6)	3 (7.7)
>8	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

Table 2
Pain characteristics among injured pediatric orthopedic surgeons.

Pain-related variables		N (%)
How often the injured surgeon feels pain	No pain	10 (31.3)
	Monthly	2 (6.3)
	Weekly	2 (6.3)
	Multiple times a week	9 (28.1)
	Once every day	5 (15.6)
Pain Severity Scale	Multiple times a day	4 (12.5)
	<2	2 (9.5)
	2–4	14 (66.7)
	5–7	4 (19.0)
	>8	1 (4.8)
Duration of pain	1–6 d	12 (54.5)
	1–4 wk	6 (27.3)
	1–3 mo	0 (0)
	4–11 mo	1 (4.5)
	>1 y	3 (13.6)
Effect of pain on performance at time of injury	No effect at all	5 (20)
	No effect but increased discomfort	11 (44)
	Minimal effect on performance	6 (24)
	Moderate effect on performance	3 (12)
	Severe effect on performance	0 (0)

Table 2 shows the pain characteristics and effect on performance. All surgeons severely affected by occupational injuries in terms of performance reported back injuries as the most substantial occupational injuries. Back pain was also the most common complaint among all pediatric orthopedic surgeons who have been suffering from pain due occupational injuries for over a year.

Approximately 30.3% reported their injuries to their institution. Respondents who received medical care because of their injuries represented 45%. Approximately 12.5% of injured personnel stated missing days of work due to injury. The majority of respondents (60%) missed days of work because of direct injuries to their hands, while 40% missed work due to musculoskeletal complaints (mostly back pain). The number of missing days ranged from 2 to 30 days with an average of 7 days.

The answers to questions about the institutional resources to meet the recovery needs along with the accessibility of support and knowledge about protection are presented in Table 3.

4. Discussion

The present study demonstrated a very high rate of occupational injuries among pediatric orthopedic surgeons. Unfortunately, only 30.3% reported the injuries to their institutions. It is known that the consequences of occupational injuries do not involve only the injured health care worker, but the patients being treated as viral transmission have been reported in the literature.^[9,12] It is of utmost importance to state that out of the 11.1% of surgeons who sustained their injuries while operating on infected patients, none of them reported the injuries to their institutions.

Pediatric orthopedic surgeons perform a wide variety of surgeries including many types of osteotomies to surgically correct deformities.^[13,14] For instance, in developmental dysplasia of the hip, a pediatric orthopedic surgeon may need to perform several tasks in a single session in the operating room such as adductor tenotomy, open reduction, acetabuloplasty, and femoral shortening osteotomy.^[15,16] All these tasks involve using

Table 3
Institutional resources, accessibility of support, and knowledge about protection among pediatric orthopedic surgeons.

Variable		N (%)
Institutional resources to meet recovery needs	Rehabilitation facilities	8 (24.2)
	Disability benefits	0 (0)
	No resources were available	7 (21.2)
Accessibility of support	Unable to answer	18 (54.5)
	Very accessible	6 (18.2)
	Somewhat accessible	15 (45.5)
Read or take course about protection	Inaccessible	3 (9.1)
	Unable to answer	9 (27.3)
	Yes	11 (28.2)
Resources of knowledge about protection	No	28 (71.8)
	Mandatory course from your institution	6 (50)
	Optional course inside your institution	0 (0)
	Optional course outside your institution	4 (33.3)
	Other	2 (16.7)

sharp tools and instruments which, if not handled properly, can cause serious occupational injuries. These tools and instruments include needles, scalpels, a cutting saw, sharp retractors, bone hooks, osteotomes, drills, and screws.^[17–20] Although wearing double gloves is encouraged among orthopedic and trauma surgeons, it has been reported that up to 10.7% of the surgeons will have their inner gloves perforated. This compromises the surgeon–patient barrier exposing surgeons to direct blood contact.^[21] The risk of inner gloves perforations was way less among pediatric orthopedic surgeons (0.3%); however, there was an association between perforated gloves and postoperative infection in 75% of the cases.^[22] In this regard, the culture and risk perception are believed to be key elements in reducing the incidence of occupational injury.^[18]

The risk of hepatitis B (HBV) transmission following a single needle stick injury is relatively high (6%–30%). The risk of hepatitis C (HCV) after a needle stick injury is 1.8%, while the risk of human immunodeficiency virus (HIV) transmission is 0.3%.^[23] The aforementioned rates should never be underestimated especially because almost 55% of the injuries among our participants were from sharp objects contaminated with blood. During data collection, we were told by many of the respondents that none of them knew about the HBV, HCV, or HIV status of the patient before and sometimes even after sustaining a needle stick injury. The fact that surgeons consider pediatric patients to be at low risk of acquiring these viral infections, compared to adult patients, may explain the under-reporting of occupational injuries in pediatric orthopedic surgeons.^[24]

Blood splashes were the most common cause of eye injury among all pediatric orthopedic surgeons. All injured participants were not wearing eye shields at the time of injury despite the availability of eye shields in their hospitals. Although blood has the highest concentration of viral titers,^[25] De Silva et al^[6] concluded in their paper that the majority surgeons and their assistants do not appreciate the risk of viral transmission through blood splashes. Therefore, it is essential to emphasize on protecting the eyes regardless of the age, level, or experience.

The prevalence of musculoskeletal pain is more among surgeons (37%) compared to other physicians (20%).^[26] The

rate of lower back pain in our study was 22.8% among all respondents. It has been reported that standing without the freedom to sit increases the risk of experiencing a lower back pain. Possible explanations are the inappropriate positioning, posture during surgery, and prolonged standing.^[27] In the United Kingdom, the prevalence of back pain among surgical consultants was approximately 46.2%.^[28] We think that the reason behind the higher rates of musculoskeletal pain among surgeons, in other studies, is the higher weight of adult patients; nevertheless, the rate is still high in pediatric orthopedic surgeons. Thus, implementing ergonomic guidelines to optimize the environment and minimize the strain should be initiated.^[28–30]

Occupational injuries among orthopedic surgeons are considered a global problem. In a British study, 47% of the surgeons sustained at least one sharp injury over a 12-month period. Only 33% reported their injuries.^[31] In the United States, up to 87.5% of the trauma orthopedic surgeons had at least one occupational injury during their career; they reported a significant association between the years of performing surgery and the prevalence of occupational injuries among orthopedic surgeons.^[5] Choi et al.^[2] found that 36% of injured participants did not report their injuries because of the processing time or fear of embarrassment. Another important reason, which we think some of our respondents believe in, is perceiving a patient as a low risk for carrying HBV, HCV, or HIV.

The surveyed population is relatively small and the results cannot be generalized to pediatric orthopedic surgeons who are practicing outside the Kingdom of Saudi Arabia. Furthermore, we did not address the attitude of surgeons toward practicing protective measures and its effect on the rate and number of occupational injuries in the field of pediatric orthopedics which we believe should be investigated in future research projects.

It is crucial to educate all pediatric orthopedic surgeons about the protective measures and risks of injury. It is also essential to address the problem of not reporting the injury and to facilitate the reporting process. The support and access to the institutional resources should be fully provided to all injured personnel. We also recommend implementing ergonomic guidelines to optimize the environment in the operating room and minimize the strain.

In conclusion, the rate of occupational injuries among pediatric orthopedic surgeons is very high. The majority did not report the injuries to their institutions. Support and access to the institutional resources should be provided to all injured personnel. Educational programs and courses about occupational injuries and the protective measures should be implemented in all hospitals and health care institutions.

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