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Epidemiology of occupational hand injury in Hong Kong

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- Objectives** To study the epidemiology of occupational hand injuries and associated social and industrial factors.
- Design** For this retrospective case series of patients with occupational hand injuries, case records were retrieved to gather data. In addition, all the subjects were interviewed by a single interviewer using a predesigned questionnaire.
- Setting** Division of Hand Surgery, Department of Orthopaedics and Traumatology, Queen Mary Hospital, Hong Kong.
- Patients** A total of 250 patients with occupational hand injuries were treated during the period from 1999 to 2001. This period was chosen to obtain 10 years of follow-up data to assess return to work and any secondary injuries.
- Main outcome measures** Personal particulars (gender, age, marital status, education level, length of stay in Hong Kong, type of employment, wage system, personal habits, family size, number of breadwinners, income), type of industry and mode of injury, causes of injury according to the worker, work conditions, type of injury, and treatment given.
- Results** Two groups of workers in our study had more occupational hand injuries, namely those with less than 1 year of experience on a new job and immigrants from China. Factors associated with a large proportion of occupational hand injuries were male gender with personal risk factors (smoking and regular consumption of alcohol, long working hours), and in the case of machine operators, inadequate training and use of safety devices.
- Conclusion** Occupational hand injuries lead to loss of working hours and compensation. For prevention, the workplace should be made into a safer and work-friendly environment. Workers should also have sufficient training.

New knowledge added by this study

- Less than 1 year of experience on a new job and being an immigrant from China were risk factors for occupational hand injuries.
- Other risk factors included male gender, being a smoker, regular consumption of alcohol, long working hours, inadequate training, and safety devices not being used.

Implications for clinical practice or policy

- The workplace should be devoid of hazardous materials and offer appropriate protective gear.
- Workers require frequent occupational safety training and work experience before operating heavy machinery.

Key words
Accidents, occupational; Hand injuries;
Life style; Risk factors; Wounds and
injuries

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Introduction

For mankind, hands are essential organs and their agility and dexterity are vital to our daily lives. This is particularly true for the manual workers and craftsman who depend on their hands for their livelihood. Occupational hand injuries refer to all hand injuries suffered by manual workers (skilled/semiskilled/unskilled) while on duty. Hong Kong, like other cities, suffers from a high incidence of occupational hand injuries, specifically industrial hand injuries. The economic, social, and physical impact of permanent or temporary disabilities on the loss of productive working hours is a heavy burden on the local community.

香港職業性手部外傷的流行病學

- 目的** 探討職業性手部外傷的流行病學以及有關的社會和工業因素。
- 設計** 對職業性手部外傷進行病例回顧研究，並由一位研究人員利用預先設計好的問卷進行訪問。
- 安排** 香港瑪麗醫院矯形及創傷外科部的手外科部門。
- 患者** 從1999到2001年因職業性手部外傷而到上述部門應診的250名病人。選擇這三年的患者資料可以讓本研究追訪隨後十年期間患者返回工作崗位後的情況，以及是否有次發性手部外傷。
- 主要結果測量** 病人的個人資料（性別、年齡、婚姻狀況、教育程度、居住香港年期、職業、薪金制度、個人習慣、家庭成員數目、負擔家計的人數、收入）、職業的類型及受傷模式、據受傷者提供的受傷原因、工作環境、受傷類型及治療。
- 結果** 上任不足一年的員工以及從中國來的移民均有較高比率的職業性手部外傷。此外，大多數職業性手部外傷都與下列因素有關：具風險因素的男性員工（有吸煙及飲酒習慣的、須長時間工作的）；在須操作機械的環境中工作但訓練不足及未有做足安全措施的員工。
- 結論** 職業性手部外傷不但浪費工作時間，更牽涉賠償。要避免職業性手部外傷，安全及友好的工作環境是必需的。員工亦需要有足夠的訓練。

Here we report the socio-demographic characteristics of a series of occupational hand injuries treated in a tertiary referral centre, as well as some of the related occupational factors.

Methods

This was a retrospective study of 250 patients, who had occupational hand injuries during the period between 1999 and 2001. The subjects were recruited to examine return to work and secondary injury outcomes during a 10-year follow-up. This paper reports the baseline characteristics of these patients and the follow-up results will be reported separately in another paper (under preparation). A 10-year period of follow-up was chosen to assess long-term impact on return to work and any secondary injuries. The study site was Queen Mary Hospital, which is a teaching hospital and tertiary referral centre situated on the south side of Hong Kong Island, and treats a population of approximately one million inhabitants. All patients with occupational hand injuries treated in our hospital are followed up at a special hand clinic where the case notes are stored. All incident occupational hand injury cases occurred and followed up during the study period were retrieved for this study.

In addition to the clinical notes obtained in the records, all the patients were interviewed by a single interviewer using a predesigned questionnaire. The interview was conducted during each patient's hospital admission for the occupational injury, and a designated occupational therapist collected information on the job nature and workplace environment. Parameters under study included: personal data; type of employment; the job description and mode of injury; the patient's perception of the accident's cause; and the working conditions of the injured worker. Personal data collected entailed: gender, age-group, marital status,

TABLE 1. Personal characteristics of the injured workers

Characteristic	No. (%)
Sex	
Male	232 (93)
Female	18 (7)
Age-group (years)	
10-20	12 (5)
21-30	73 (29)
31-40	52 (21)
41-50	58 (23)
51-60	42 (17)
≥61	13 (5)
Marital status	
Married	92 (37)
Single	158 (63)
Education level	
Illiterate	148 (59)
Primary school	72 (29)
Secondary school	18 (7)
Post-secondary and above	12 (5)
Length of stay in Hong Kong (years)	
>7	87 (35)
≤7	163 (65)
Employment	
Full time	98 (39)
Part time/summer work	152 (61)
Wage system	
Monthly	159 (64)
Daily	73 (29)
Piece work	18 (7)
Personal habits	
Smoking	152 (61)
Regular alcohol consumption	112 (45)
Regular drug consumption	23 (9)
Sleep well at night generally	180 (72)
Past accidents or near accidents at work	106 (42)
Severe accidents outside work in the past	21 (8)

level of education, and Hong Kong residency status (a resident was defined as an inhabitant with more than 7 years, continuous residence in Hong Kong and those who were not termed immigrants). Job descriptions included: metal work, textile work, wood work, work with plastics, food handling, construction, electronics, printing, and others. The mode of injury included: power press, cutting, sawing, spinning, grinding, printing, unclassified machining, or injuries not caused by machinery. The patient's perception of the injury included: no idea, pure accident, faulty machinery, unfamiliarity with machine, no protection, extra work, poor environment, carelessness, hurry, fatigue, lack of training before operating machinery, and lack of safety device(s) and machine design. Work conditions included: work experience, overtime, no breaks, no holidays allowed, pressure at work, satisfaction at work and with workmates, the physical environment, and occurrence of other accidents.

Most of the hand injuries in our 250 patients could be classified as minor, since the majority resulted in a residual functional disability of less than 5 to 10% (based on range of motion and grip strength). We also examined the type of treatment given to these patients (suturing, reamputation, dressing, skin grafting, tendon repair, and nerve repair) and the number of days of hospitalisation.

Results

As all of our patients were treated for injuries on duty, none were lost to follow-up. Most of them (93%) were males; 29% were between the ages of 21 and 30 years; 63% were unmarried; 59% were illiterate; 61% were part-time workers; and 64% received monthly wages (Table 1). Regarding social factors, patients with occupational hand injuries were usually smokers (61%), and 45% regularly consumed alcohol (1-2 cans of beer a day) [Table 1]. In all, 65% of the hand injuries were in immigrants and 35% in Hong Kong residents.

In our series, construction site workers formed the largest group (n=76, 30%) followed by food handlers (n=50, 20%), metal workers (n=37, 15%), and wood workers (n=24, 10%). The most frequent mode of machine-related injury in our patients was during cutting, followed by work with power presses and grinding (Table 2).

Workers had different perceptions as to the cause of their industrial injury (Table 3). Of the 328 possible industrial factors stated by the 250 patients, 93 (37%) were reported to be pure accidents. Analysis of factors related to hand injuries caused by machines showed that only 61% of the workers were briefed about their jobs, whilst 16% did not receive any form of training. Furthermore, 90% of the workers were happy with the machine designs and 73% of them were using the safety devices provided at work.

In relation to the work conditions of injured workers, most of the victims (58%) reported work experience of less than 1 year (Table 4). Furthermore, 45% of them reported overtime work and 49% of them did not have tea breaks (apart from lunch).

The commonest types of injury suffered were lacerations followed by cuts and crush injuries (Table 5). Most of the injuries were treated by simple procedures only, and included suturing (n=372) and dressings (n=284). However, in a sizable number of injuries, repair procedures (103 tendon repairs and 70 nerve repairs) and salvage procedures (38 reamputations) were performed. Most patients (98 patients) were hospitalised for only 1 to 3 days.

Workers with a previous injury were prone to repeat insults; 42% of injured workers had a history of actual or near work accidents, and 26% of them had had an accident in the past 1 year. Most of our patients had sound sleep at night and only 8% had suffered serious accidents outside work in the past. It was possible that the lack of proper training and inappropriate work environment lead to repetitive insults.

TABLE 2. Types of industry and mode of injury

Type of Industry	Power press	Cutting	Sawing	Spinning	Grinding	Printing	Unclassified machine	Non-machine	Total
Metal work	7	5	5	3	6	3	3	5	37
Textile	2	0	0	6	0	0	4	0	12
Wood work	5	3	7	0	0	0	2	7	24
Plastic work	2	2	0	0	0	1	4	0	9
Food handling	0	8	0	0	7	0	3	32	50
Construction	3	4	3	0	7	1	2	56	76
Electronics	2	2	0	0	0	0	1	2	7
Printing	3	1	0	0	0	8	0	2	14
Unclassified	1	2	1	0	3	0	2	12	21
Total	25	27	16	9	23	13	21	116	250

TABLE 3. Perceived causes of injury

Patient's idea of the cause	No. (%)
No idea	33 (13)
Pure accident	93 (37)
Faulty machine	59 (24)
Unfamiliar with machine	34 (14)
No protection	21 (8)
Extra work	62 (25)
Poor environment	26 (10)
Total industrial factor (those related to machine-involved hand injuries)*	328
Machine-involved hand injury	134 (54)
Training before operation	
None	22 (16)
Briefed	82 (61)
Structured training programme	30 (22)
Safety device installed	
Used safety device provided	98 (73)
Weekly check on safety device	36 (27)
Machine design and operation	
Convenient and acceptable	120 (90)
Needed modification	14 (10)
Carelessness	92 (37)
Hurrying	23 (9)
Fatigue	59 (24)
Total human factors*	174

* Each patient may have quoted multiple causes

TABLE 4. Work conditions of the injured workers

Work conditions	No. (%)
Experience of ≤1 year	145 (58)
Overtime	112 (45)
No tea break apart from lunch	123 (49)
Holidays allowed (days per month)	
1-4	106 (42)
>4	25 (10)
None	9 (4)
Pressure at work	76 (30)
Satisfied with their job	66 (26)
Satisfied with their workmates	172 (69)
Physical environment unsatisfactory	92 (37)
Other accidents occurred in the past year	65 (26)

Discussion

Our study evaluated the characteristics of occupational hand injuries and associated factors. Understanding predisposing factors of occupational hand injuries is important as industrial accidents are notoriously difficult to prevent. Based on personal

data in our series (Table 1), most of the victims of occupational hand injury were males (93%), whilst 29% were aged 21 to 30 years, 63% were unmarried, 59% were illiterate, 61% were part-time workers, and 64% were receiving monthly wages. This indicates that young, illiterate, single, part-time working males are particularly prone to occupational injuries, which is consistent with findings in studies from around the world.¹⁻⁶ Males are more likely to perform hard labour and are therefore at increased risk of injuries at work. Young and illiterate subjects are usually less likely to be familiar with the job's nature and could be more reckless. Thus, having educated workers with a sense of responsibility about their job appears important to preventing work-related injuries.

Regarding social factors (Table 1), smoking and regular alcohol consumption were commonly associated with occupational hand injuries. Especially in the workplace, these social habits decrease alertness and thereby lead to mishaps at work. Moreover, smoking and alcohol dependence are well-recognised risk factors for occupational injuries. Smoking can lead to many other medical illnesses that also disrupt normal physical functions of the body.⁷ Alcohol can also lead to many medical disorders and cause poor balance by impairing the vestibulo-ocular reflexes.^{8,9} Thus, to avoid occupational injuries, in the workplace these habits should be strictly regulated. Other risks that were not reported in this study included obesity and hearing and cognitive impairment.^{10,11} Obesity leads to prolonged sick leave and higher ergonomic demands.^{12,13} Low-income families living in poor environmental conditions could be affected physically and psychologically, which could also be detrimental to work performance. Lower socio-economic status workers are at greater risk of occupational hand injuries, partly because they usually have more physically demanding jobs, poorer health status, and are more likely to be smokers and/or alcohol dependent.¹¹ As shown in Table 4, only 26% of the workers were actually satisfied with their work and their working conditions.

We tried to investigate whether a particular type of industry or assigned job made workers more prone to occupational injury. It is well accepted that work with machinery confers a high risk.^{14,15} The data in Table 2 show that of all the industry categories associated with occupational hand injuries that we treated, construction site workers formed the largest group, followed by food handlers, metal workers, and wood workers. Work experience is as important as the type of work. Of all those enduring industrial accidents, 58% had less than 1 year of work experience.

An ergographic study showed that allowing sufficient refractory periods during muscular effort is important.¹⁶ The time for recovery increases with repeated physical exertion and prolonged working.

TABLE 5. Types of injury and their treatments

Type of injury*	Dressing	Suturing	Reamputation	Skin grafting	Tendon repair	Nerve repair
Crush	12	87	24	11	19	13
Cut	75	98	1	0	12	9
Laceration	56	187	3	34	57	33
Abrasion	123	0	0	0	0	0
Amputation	0	0	10	0	15	15
Burn	18	0	0	9	0	0
Total	284	372	38	54	103	70

* Multiple types of injuries could occur in the same patient

TABLE 6. Hospitalisation of patients

No. of days in hospital	No. of immigrants	No. of Hong Kong residents
<1	15	26
1-3	65	33
3-5	27	7
5-7	29	9
7-9	18	5
>9	9	7

Higher work demands lead to fatigue and increased risk of injury.¹³ For economical expenditure of energy, workers need to only rest when fatigued to an uncomfortable degree. Since recovery time increases rapidly as fatigue progresses, it is advisable for a worker to rest before prolonged fatigue sets in, or work at a slower pace so that rest periods become unnecessary.¹⁶ In our study too, we found that workers were commonly overworked. Of all the injured workers, 45% worked overtime and 49% did not have any breaks, except for lunch. Workers who feel rushed to meet deadlines set by employers are at increased risk of injury.⁶ Many workers were also improperly trained. Only 61% of workers were briefed about their jobs and up to 16% received no training. The machine design satisfied 90% of the workers and 73% of them used safety devices provided at work. In studies conducted around the world, equipment malfunction and equipment or jobs that the workers were not used to were common risk factors for injury in the workplace.^{2,6,17,18} Adequate protective equipments such as protective gloves are also regulations that should be enforced.¹⁹

In Hong Kong, labour manpower is chronically inadequate. This particular manpower shortage is partly relieved by Chinese immigrants arriving to work as individuals or as a part of a group sponsored by various local organising bodies. However, such workers are especially at risk for occupational accidents (65% of all our patients). Most immigrants worked with unfamiliar machine tools, having

arrived from a farming or sedentary job background. Expecting them to operate sophisticated machinery is bound to be hazardous. Our study also found that immigrants had more severe injuries, as indicated by the greater number of days spent in hospital (Table 6). Similarly in a Turkish study, immigrant workers were at greater risk for occupational hand injuries.³ Causative factors include: unsuitable selection of workers for the dangerous machinery, substandard training in the use of machinery and substandard safety precautions. Table 5 also shows that lacerations were the most common type of injury, followed in descending order by cuts, crush injuries, abrasions, amputations, and burns.

This study found that two groups of workers were especially susceptible to occupational hand injuries. They were workers with less than 1 year of experience on a new job, and immigrants from China. A large proportion of occupational hand injuries were in males with personal risk factors (smoking and regular alcohol consumption), long working hours and inadequate training, and those who underused safety devices while operating machinery. Although these variables were merely descriptive and not causative, they were present in large proportions of our injured workers. Thus, further prospective studies are needed to accurately delineate these risk factors.

Conclusion

Occupational hand injuries are a burden to society, in terms of loss of working hours and work compensation. There are three aspects to creating a safe and work-friendly environment. First, the workplace should be devoid of hazardous materials. There should also be provision of appropriate protective clothing and safety devices, such as gloves and compliance to using them should be maintained. The equipment, especially machinery, should have proper and frequent maintenance checks to avoid accidents. Second, workers should have frequent occupational safety training and adequate work experience before operating heavy machinery.

Third, appropriate first-aid training is an important preventive measure. Chronic medical disorders may impair the safe operation of equipment. Avoidance of smoking and alcohol should be strictly enforced. There should also be policy measures in place for

compensation of the injured worker. This study provided some insights into the current status of work injuries in Hong Kong and identified at-risk individuals so that proper preventive measures can be implemented.

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