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LEFT-HANDEDNESS AS A RISK FACTOR FOR HEAD INJURIES
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LEFT-HANDEDNESS AS A RISK FACTOR FOR HEAD INJURIES

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ABSTRACT

Objective: **To study prevalence of left-handedness among traumatic patients with head injuries.**
Design: **A case-control study.**
Setting: **Queen Elizabeth Central Hospital, Blantyre, Malawi.**
Subjects: **One hundred and sixty three traumatic patients newly admitted to a surgical ward at Queen Elizabeth Central Hospital, Blantyre during one month period with exception of patients with arm injury, severe injury and confused patients.**
Main outcome measures: **Maximal grip strength of both hands, questionnaire on hand preferred for eight habitual activities.**
Results: **The overall prevalence of left-handers determined on the basis of bilateral asymmetry in maximal grip strength was non-significantly higher in traumatic than in the control group. Relative to the control group, lefties were over-represented among victims of head injury, while prevalence of left-handers among patients with leg and trunk injuries and among controls was similar. Left-handed patients were more likely to sustain head traumas during fighting, road transport accidents and sport activities. Possible reasons for increased level of traumatisation among sinistrals are discussed.**
Conclusion: **Left-handedness is a risk factor for head injuries obtained during confrontational activities. Therefore, left handers should avoid such type of behaviour in order to reduce traumatisation rate.**

INTRODUCTION

Several authors studied prevalence of left handedness among trauma patients. Thoras, Behrman and Degnan(1) have demonstrated that left-handers have considerably greater risk (4.9 times) of serious injuries of the hands than right handers. It has also been shown(2,3) that proportion of left handers among children and adolescents having unintentional traumas is considerably higher relative to control group of subjects without traumas and frequencies of injuries and related hospitalisation in left-handed children are higher than in right-handers. Sport injuries - particularly hand traumas - are also more common in left-handers(3-5). MacNiven(6) found increased proportion of left-handers among patients with traumatic brain injuries. He also demonstrated that left-handers were more likely to experience injuries during road traffic accidents. These data indicate that left-handedness is a risk factor for amputating injury of the dominant hand and brain injuries in children and adults and for different types of traumas in adolescents. However, prevalence of left- handedness among patients having mild and moderate head injuries has not been studied.

All studies of prevalence of left-handedness among trauma patients were conducted in Western countries and used personal impression and questionnaires for assessment of hand preference. Such methods of detection of handedness might underestimate the actual number of left-handers in African communities due to strong cultural opinion against left-handedness. Therefore other methods of assessment of hand preference such as measurements of bilateral asymmetry in maximal grip strength or motor skill tasks should be used for this purpose.

Prevalence of injury increases steadily in developing countries(7,8) and identification and counselling of a risk group of persons will help in reduction of both intentional and unintentional traumas. This study was undertaken to observe the prevalence of left-handedness determined on the basis of grip strength measurements among trauma patients with mild and moderate head injuries.

MATERIALS AND METHODS

The study was conducted at Queen Elizabeth Central Hospital, Blantyre, Malawi. All trauma patients newly admitted to a surgical ward during approximately one month period were approached. Patients with hand and arm injuries, severe injuries and confused patients unable to perform grip strength measurements were excluded from the study population. The rest of the trauma patients were recruited on the basis of informed consent. Subjects for a control group were randomly selected

from among visitors to the patients. Controls were matched to the cases by gender and age. Table 1 shows distribution of patients and subjects in control group according to age and sex.

Table 1

Age and gender of patients with traumas and control group of subjects

Age group (years)	Patients		Control	
	Males	Females	Males	Females
10-19.9	23	8	12	6
20-29.9	19	11	13	8
30-39.9	41	13	24	13
40-49.9	25	6	21	3
50+	14	3	6	2
Total	122	41	76	32

A trained observer recorded locations, type of injuries, and situations where injuries have been sustained. Maximal grip strength (MGS) was measured using hand grip dynamometer and recommended procedure(9). Grip strength of each hand was measured three times and recorded to the nearest 0.1 kilogram. The highest reading for each hand was taken as MGS of the hand. Two groups of subjects were identified according to a stronger hand: subjects with stronger right hand (SRH) and persons with stronger left hand (SLH). As the level of bilateral asymmetry in MGS was not analysed in this study, individuals with small difference between hands were not separated from SRH or SLH persons for the further analysis.

Handedness was also determined using a questionnaire incorporating questions on hand preferred for eight habitual activities such as writing, drawing, cutting with scissors, striking a match, brushing teeth, boxing and playing games with a racket or bat.

Statistical analysis was carried out using software Epi Info 6. Chi-square test was used to compare categorical variables. The odds ratio and logit limits were estimated using Mantel-Haenszel method. Statistical significance of differences between proportions for unpaired cases was estimated using method described by Armitage and Berry(10).

RESULTS

The prevalence of left-handedness detected using questionnaire in trauma and control groups was similar (4.6% versus 4.9%). The overall prevalence of SLH among trauma patients was non-significantly higher (15%) than in the control group. Table 2 demonstrates the differences in prevalence of SLH between patients with different locations of injury. Relative to the control group, left-handers were over-represented among victims of head injury. Prevalence of left-handedness among patients with leg and trunk injuries and in the control group was similar.

Table 2

Prevalence of stronger left hand among patients with different location of injury

Location of injury	No. of patients	Prevalence (%)	Odds ratio (95% CI)
Head	59	44.1**	1.96 (1.01 to 3.77)
Trunk	21	28.6*	0.99 (0.36 to 2.75)
Leg	83	26.5*	0.90 (0.47 to 1.69)
Total	163	33.1*	1.23 (0.72 to 2.07)
Control	108	28.6	

CI = confidence interval
* Indicates non-significant difference between control and trauma groups.
** Indicates significant difference at $P < 0.05$

Table 3

Prevalence of stronger left hand among trauma patients according to situations where injuries have been sustained.

Situation	No. of patients	Prevalence (%)	Odds ratio (95% CI)
Sport and games	7	57.1*	3.31 (0.70 to 15.33)
Robbery	17	29.4*	1.03 (0.34 to 3.15)
Falls	18	22.2*	0.71(0.21 to 2.34)
RTA	36	36.1 *	1.40 (0.63 to 3.13)
Work	34	29.4*	1.03 (0.44 to 2.39)
Fighting	16	50.0*	2.48 (0.85 to 7.76)
Home	23	26.1*	1.08 (0.41 to 2.89)
Dog attack	12	25.0*	0.83 (0.21 to 3.25)
Total	163	31.9*	1.23 (0.72 to 2.07)
Control	108	28.7	

RTA=road traffic accidents
*Indicates non-significant difference between control and trauma groups

Table 4

Prevalence of stronger left hand among trauma patients with head injury according to situations where injuries have been sustained.

Situation	No. of patients	Prevalence (%)	Odds ratio (95% CI)
Sport and games	3	75.0**	7.45 (1.88 to 29.67)
Robbery	10	33.3*	1.24 (0.29 to 5.20)
Falls	6	33.3*	1.24(0.21 to 7.10)
RTA	16	56.3**	3.19 (1.10 to 9.20)
Work	11	27.3*	0.93 (0.23 to 3.74)
Fighting	8	75.0***	7.45 (1.43 to 38.8)
Home	5	20.0*	0.62 (0.07 to 5.75)
Total	59	35.6*	1.96(1.01 to 3.77)
Control	108	28.7	

* Indicates non-significant difference
** Indicates significant difference at $P < 0.05$
*** Indicates significant difference at $P < 0.005$

Table 3 shows the prevalence of SLH among trauma patients by situation where injuries have been sustained. Relative to the control group, victims of fighting, sport and road transport accidents had higher prevalence of SLH. However, the differences were statistically non-significant. Due to increased prevalence of SLH among patients having head injury, this group was analysed separately from the rest of the patients. Data in Table 4 show that left-handed patients had significantly higher risk to sustain head injury during sport activities, fighting and road traffic accidents.

DISCUSSION

Contrary to the reported data(1-6), the prevalence of left-handedness in this study detected using questionnaire was equal among the trauma and control groups. It also was about two times lower in both groups of subjects than in studies conducted in western countries(6,11-13). Theoretically a high threshold for the expression of left-handedness or low incidence of sinistrality itself might explain low proportion of left-handers in our investigation. This confirms our early suggestion that criterion for assessment of hand preference should be relatively independent of cultural factors.

Small differences between trauma and control groups were observed when bilateral asymmetry in maximal grip strength was used as a criterion of sinistrality. This study identified situations where left-handers are more vulnerable to sustain injuries as well as more frequent locations of injury in this category of individuals. Left-handers were over-represented among victims of head injuries while prevalence of left-handedness among patients with other locations of traumas and among non-traumatised persons was not different. These data indicate that sinistrality might be considered as a risk factor for head injuries only rather than as a general risk factor for different types of traumas. Because of the fact that handedness was detected on the basis of bilateral asymmetry in maximal grip strength in our study, it was not possible to assess it in patients with injured upper extremities. However reported data(1) indicated that left-handedness is a risk factor for amputating hand injury but prevalence of minor injuries of the hands is the same for both types of handedness.

The precise reasons for increased level of head traumas among sinistrals are not known. We can only speculate that three groups of factors might be important. Firstly, left-handers tend to use both sides of the body for different behavioural activities(14), therefore both sides are potentially exposed to trauma. Contrary, the left side of the body of the right handers is exposed to trauma much less than the right side. Secondly, some psychophysiological features of the left-handers might stimulate their involvement in potentially dangerous activities where trauma can easily be sustained. For example, it has been demonstrated that left-handers are over-represented in confrontational activities such as sports in which opponents are interacting closely(13-16). Subjects with stronger left hand in this study were more likely to obtain both intentional (fighting) and unintentional (sport activities and road traffic accidents) injuries of the head. To some extent these activities can be classified as confrontational. Thirdly, attacking left handers have an advantage because they are able to hit an opponent from the left side but defending sinistrals are in a disadvantage position. Therefore, in confrontational activities when they have to defend themselves, the rate of traumatisation increases.

In conclusion, this study shows that left-handedness is a risk factor for head injuries obtained during confrontational activities. Therefore left-handers should avoid such type of behaviour in order to reduce traumatisation rate.

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