FREQUENCY OF CO-MORBIDITIES ASSOCIATED WITH SPINAL CORD INJURY

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ABSTRACT

Objective: To determine the frequencies of comorbidities (dyslipidemias, diabetes mellitus, and hypertension) in patients with spinal cord injury (SCI) of duration > 1 year.

Study Design: Case control.

Place and Duration of Study: Spinal Cord Injury Department, Armed Forces Institute of Rehabilitation Medicine (AFIRM) Rawalpindi and Department of Chemical Pathology, Army Medical College, National University of Sciences and Technology (NUST), from October 2013 to March 2014.

Patients and Methods: Thirty six patients with complete spinal cord injury (SCI), level C5 to T12 were included by non-probability, convenience sampling. Control group consisted of age and sex matched healthy individuals. A detailed medical history was obtained. Anthropometric measurements and blood pressure were recorded. Fasting blood samples were obtained and analyzed for plasma glucose and serum lipid profile.

Results: Out of thirty six patients, 31 (86.1%) were male and 5 (13.9%) were females; their mean age was 36.6 ± 11 years. Mean duration of injury was 6.04 ± 3.35 years. Among cases, dyslipidemias were detected in 25 (69.4%) patients while 7 (19.4%) patients had diabetes mellitus. Whereas in control group, frequency of dyslipidemias and diabetes mellitus were significantly lower than cases i.e 13.8% and 5.5% respectively. Also no significant difference was found between blood pressures of study group when compared with control group.

Conclusion: Individuals with chronic SCI had more frequent associated co-morbid conditions like dyslipidemias and diabetes mellitus than normal individuals. Early screening is recommended in patients having SCI >6 months for better patient care and reduction in long term comorbidities in such patients.

Keywords: Comorbidity, Diabetes mellitus, Dyslipidemias, Spinal cord injury.

INTRODUCTION

Injury to the spinal cord is a life altering and chronic state of disability affecting the individual's independence and sense of self-worth, and creates additional health problems in these individuals[1]. Patients with chronic spinal cord injury (SCI) are at increased risk of developing other medical complications such as cardiovascular disease (CVD), various lipid abnormalities and carbohydrate intolerance[2,3].

CVD is accounted for the most frequent cause of premature death in persons suffering from chronic SCI[4]. Previous studies have found that unfavourable lipid profiles, diabetes mellitus (DM), and systemic arterial hypertension (SAH) could be the factors responsible for this accelerated CVD in persons with SCI[5].

In addition, physical inactivity, smoking and increased social stress aggravate the risk of CVD[6,7]. Thus, clinicians need to be aware of these risk factors and develop protocols to closely monitor such patients. Screening for secondary medical complications in SCI patients would be crucial to reduce the risk of additional physical disability, and consequently will enhance the quality of life among these individuals.

Medical literature search has revealed that nationally no study has been published to determine the frequency of dyslipidemias, hypertension and DM in patients with SCI. The current study aimed to determine the frequency of comorbidities associated with SCI. The results of the study will help in planning the various interventions and therapeutic strategies to

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prevent these medical complications. Moreover, the findings of this study can be beneficial in reducing the frequency of CVD as well.

PATIENTS AND METHODS

This case control study was conducted at the Spinal Cord Injury Department of Armed Forces Institute of Rehabilitation Medicine (AFIRM), Rawalpindi in collaboration with Department of Chemical Pathology, Army Medical College, National University of Sciences and Technology (NUST) Islamabad, from October 2013 to March 2014, after departmental and institutional permission.

Thirty six cases and 36 controls were included in the study through non-probability convenience sampling. Patients admitted to spinal cord injury ward of AFIRM with complete spinal cord injury (SCI) (level C_5 to T_{12}) of duration at least 1 year, having ages between 20-50 years, were included in the study. While patients with non-traumatic SCI and who had a previous history of hypertension, DM, dyslipidemias, thyroid disorders, hepatic or renal impairments; and those with neurological conditions not involving spinal cord were excluded from the study.

Patients being treated with antihypertensive drugs or medications having effect on carbohydrate and lipid metabolisms were also not included in the study. Similar exclusion criteria were used for the control group.

After obtaining the written informed consent, a detailed history was taken from the patients and other relevant data like name, age, gender, contact number, address and anthropometric measurements were also entered in the proforma. Blood pressure readings were recorded twice through standard mercury sphygmomanometer, after five minutes interval and the mean was used for study analysis. After 10-12 hrs overnight fast, venous blood samples were collected under aseptic conditions and sent to laboratory for complete blood count and estimation of serum lipid profile, plasma fasting glucose and glycosylated hemoglobin (HbA1c). Results were entered on the patient's proforma.

Systemic hypertension was defined as blood pressure >140/95 mmHg on two separate

Table-1: Basic demographic data of patients with spinal cord injury (SCI).

Characteristics	Cases (n = 36) n (%) or Mean ± SD	Controls (n = 36) n (%) or Mean ± SD
Gender		
Male	31 (86.1%)	26 (72.2%)
Female	05 (13.9%)	10 (27.8%)
Age (years)	36.6 ± 11.08	36.06 ± 10.36
Duration of Spinal Cord Injury (years)	6.04 ± 3.35	

Table 2: Comparison of frequencies of various risk factors in spinal cord injury (SCI) patients and control group.

Risk factors	Cases (n = 36)	Controls (n = 36)	*p*-value*	Odd Ratio
Serum TC>6.2mmol/l	3 (8.3%)	Nil	0.239	7.63
Serum LDL-c>3.4mmol/l	12 (33%)	2 (5.5%)	0.008	8.5
Serum HDL-c<0.9mmol/l	19 (52.7%)	2 (5.5%)	<0.001	19
Serum TG> 2.3mmol/l	13 (36.1%)	3 (8.3%)	0.009	6.22
FPG> 7.0mmol/l	7 (19.4%)	2 (5.5%)	0.093	4.10
SBP(>140mm Hg)	2 (5.5%)	2 (5.5%)	1.000	1
DBP(>95mm Hg)	1 (2.8%)	2 (5.5%)	0.563	0.486

*$p < 0.05$ was considered as significant.
TC= total cholesterol; LDL-c = low-density lipoprotein cholesterol; HDL-c = high-density lipoprotein cholesterol; TG = triglycerides; FPG = fasting plasma glucose; SBP = systolic blood pressure; DBP = diastolic blood pressure

occasions. Diabetes mellitus was diagnosed when the patients' fasting plasma glucose levels were >7.0 mmol/l or HbA1c was >6.5%. To diagnose dyslipidemias, we used "National Cholesterol Education Project (NCEP) Adult Treatment Panel III (ATP III) guidelines" according to which dyslipidemias were defined as "serum total cholesterol (TC) >6.2 mmol/l, serum high density lipoprotein- cholesterol (HDL-c) <0.9 mmol/l, serum low density lipoprotein-cholesterol (LDL-c) >3.4 mmol/l or serum triglycerides (TGs) levels >2.3 mmol/l."

Data had been analyzed using SPSS version 20. Mean and standard deviation (SD) were calculated for quantitative variables while frequencies and percentages were calculated for qualitative variables. Chi-square test was applied to study the association between comorbidities and SCI. A *p* value <0.05 was considered as significant.

RESULTS

The study population included 36 cases and 36 controls. The mean age of case group was 36.6 ± 11.0 years (table 1). Male to female ratio was 7.1: 1.

Table-2 and fig-1 represent the comparison of the frequencies of various risk factors in SCI patients and control group. In cases, 25 (69.4%) patients had dyslipidemias, with 15 (41.7%) patients having more than one derangement in their serum lipid profiles, as compared to control group in which only 5 (13.9%) participants had dyslipidemias (OR: 14.0, 95% CI: 4.3248-45.9104, *p*< 0.001). No significant difference was found between blood pressures of study group when compared with control group.

DISCUSSION

This study determined the frequencies of dyslipidemias, DM and hypertension in patients with SCI of > 1 year duration. Upon medical literature search, it was found that no published data was available nationally on the topic similar to this study. It was observed in our study that patients with SCI had higher risk of coronary heart disease at a younger age. Yekutiel et al, reported in his retrospective study that SCI

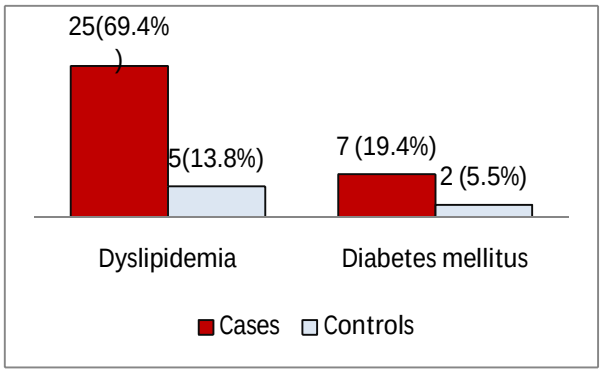

Figure-1: Comparison of frequencies of comorbidities in SCI patients and normal controls.

patients had a significantly higher frequency of hypertension and diagnosed ischemic heart disease as compared to the age matched able-bodied controls[6]. Among other risk factors, this could be attributed to a deranged pattern of lipid profile [7-9].

Dyslipidemia, an important modifiable risk factor along with low serum HDL-c concentration was noted widely among patients with SCI[10-14]. According to the criteria determined by "National Cholesterol Education Project (NCEP) Adult Treatment Panel III (ATP III) guidelines", dyslipidemias were present in 25 (69.4%) patients as compared to only 5 (13.9%) individuals of control group (*p*<0.05) of this study. These results were in accordance with the study of Vichiansiri et al, who found at least one lipid abnormality in 76.7% SCI patients[15].

Liang et al also evaluated the different risk factors between SCI patients and able-bodied men and noted that SCI patients had higher risk for low serum HDL-c[12]. These results support the findings of this study, where 52.8% SCI patients had decreased serum HDL-c levels. On the contrary to our study, Wahman et al in his study conducted on Swedish paraplegics noted that 43% of his study participants had low serum HDL-c levels while 57% had elevated low density lipoprotein-cholesterol (LDL-c) levels[13], a frequency much higher than the frequency of

elevated serum LDL-c levels (33.3%) found in our study.

Vichiansiri et al, in his study reported that 28.9% of chronic SCI patients had elevated serum triglycerides (TGs) levels[15]. In another cross sectional study conducted on 121 chronic SCI patients, Groah et al noted that 35% of the cases had elevated levels of serum TGs[16]. Similar findings were noted in our study where elevated serum TGs levels were present in 36.1% patients.

Diabetes mellitus and impaired fasting glucose (IFG) occur more frequently in SCI patients when compared to non-disabled population[17,18]. In our study fasting plasma glucose was elevated in 7 (19.4%) of the patients as compared to 2 (5.5%) of the control group. These results were in accordance with the study of Sabour et al, who also found that 13.58% of their patients had DM[19].

However, the results of our study were not in agreement with the results of Duckworth et al. He noted the presence of DM in 40% and impaired fasting glucose (IFG) in 23% of the participants in his study[20], while the current study has found much lower frequency of IFG (5.6%). No statistically significant difference was found between blood pressure measurement of patients and controls.

In the light of these findings, it is suggested that cardiometabolic risk factors should be regularly assessed in patients with SCI, along with nutrition consultation for better patient care and reduction in comorbidities affecting the quality and life span in the already disabled patients.

Small sample size and patients from only one tertiary care hospital were the limitations of this study, so its results cannot be generalized. Further studies are recommended at national levels to augment the findings of this study which will help in developing the protocols regarding various interventions and therapeutic strategies for such disabled patients.

CONCLUSION

SCI patients are at higher risk of developing cardiovascular diseases due to an increased frequency of associated co-morbid conditions like dyslipidemias and diabetes mellitus. Many of these risk factors could be modified by various therapeutic interventions and appropriate changes in individual's life style (like eating habits and physical exercise).

Disclosure

Abstract and results of this study were accepted and presented in a poster presentation at the 1st international and 3rd national conference of Physical Medicine and Rehabilitation, the RehabCon 2014, held on 04th – 06th April 2014 at Rawalpindi, Pakistan.

This study was not funded by any institution or agency.

Conflict of Interest

This study has no conflict of interest to declare by any author.

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