Psychological morbidity in soldiers after spinal cord injury

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Background: Spinal cord injury (SCI) patients usually experience multiple and ongoing, neurological, and other medical problems with significant damage to the social and psychological well-being of themselves and their families. Materials and Methods: Soldiers with SCI transferred to the regional centre after suitable stabilization of their fractures and general physical condition were included in the study. The baseline assessment included a diagnostic interview and review of case notes for a comprehensive, multi-axial diagnosis. The participants were assessed using the Barthel’s Index, the Hospital Anxiety and Depression Scale, the General Health Questionnaire, Quality of life (QOL) Index, AFMC stressful life event Scale, and the Social Support Survey with the current defense or coping style also being recorded. Similar assessments were repeated at 1 month, 6 months, and at 1 year after intake. Results: It was noticed that the mean scores on the Hospital Anxiety and Depression Scale were below the cut-off point for diagnosable disorder, or in the mild end of the spectrum. However, the measures of psychological distress and QOL showed significantly high mean scores. Anxiety Scores showed little variation over time initially, and none of the mean differences (t values) reached statistical significance. However, when the scores of intake and those at 6 months are compared, there was a statistically significant improvement. Depression scores, on the other hand, showed a steady improvement with each assessment. General lack of well-being and psychological distress along with poor QOL remained high throughout the period of assessment with little variation over time. These morbidity measures could not be accounted for by variations in stressful life-event scores or by variations in degree of disability. Although the negative correlation between anxiety and depression scores and those on the QOL index approached conventional levels of significance, there was little correlation overall between morbidity measures and the putative modifying variables at any stage of assessment. Conclusions: Although psychological symptoms of depressive and anxious spectrum was virtually universal, psychiatric illness at syndromal intensity warranting a formal psychiatric referral and management was rare in patients with SCI in the 1st year. The general well-being and QOL were expectedly dismal throughout. Expected correlations between the measures of social support and degree of disability with the measures of anxiety, depression, subjective distress, and QOL were not demonstrated. There is a need to look beyond these and explore factors such as lack of information, physical morbidity, quality of social support, and dependence for the activities of daily living to evolve a nuanced approach toward the challenge that these clientele represent.

Keywords: Anxiety, depression, disability, quality of life, spinal cord injury

Spinal cord injury (SCI) is defined as an impairment of neurological function due to damage of neural elements within the spinal canal. It does not include spinal injuries without the involvement of the neural
elements within the spinal canal where impairments are mainly orthopaedic or at times due to the damage of nerve roots. Certain pathological entities such as cervical spondylosis, Klippel–Feil Syndrome, spinal arthropathies, neoplasm, and congenital craniovertebral anomalies can result in SCI with minimal trauma. Therefore, an acute onset spinal compression syndrome due to these causes may be included in SCI. Spinal cord involvement in degenerations, infections, and neoplasm of the spine – though the disabilities produced are similar, i.e., quadriplegia/paraplegia, are however excluded.

The earliest documented mention of SCI is in the Edwin Smith Papyrus which was transcribed from the original in the 17th century. The original document was estimated to be circa 3000 BC. SCI is noted as an untreatable and fatal condition. Later Hippocrates described the complications of SCI, including the loss of control of bowel and bladder function. Over the years, the prognosis remained dismal and in World War I most SCI patients died of uro-sepsis. It was only in WW II that catheterization of the flaccid neurogenic bladder came into vogue, reducing mortality due to uro-sepsis from 100% to about 50%. For the first time, SCI patients started surviving the stage of spinal shock; due to this advance in understanding and technique.

Sir Ludwig Guttmann established a multidisciplinary SCI unit in the UK and is considered the father of modern treatment of SCI. Meanwhile, across the Atlantic, Ernest Bors through the Veterans Administration pioneered the establishment of Regional SCI Centers.

SCI has ever since, been of great importance in Military Medicine. During this phase (in the 40s and 50s), renal failure resulting from pressure effects and infections became the leading cause of mortality. Subsequent development of cystostomy procedures and potent antibiotics preserved kidney functions, treated bladder and kidney infections, respectively, resulting in nearly normal longevity for patients with SCI.

Accordingly the focus has shifted from a medical model to those emphasizing rehabilitation, social empowerment, education and enrichment of the quality of life (QOL); as life expectancy now approaches age-matched controls in developed countries and in those with access to optimal medical care.

It is noteworthy, however, that SCI patients continue to suffer from other medical morbidities such as muscle spasms, spinal pain, contractures, autonomic instability, pressure sores, and respiratory failure through out their lives and require stepped-up care frequently.

The current study hopes to document the some of the psychopathological dynamics and identify the dimensions where QOL and social adjustment can be optimized.

MATERIALS AND METHODS

The patients of SCI transferred to the center after suitable stabilization of their fractures and general physical condition were included in the study. The subjects who had significant brain trauma or cognitive deficits were excluded. If at any time during assessment, the patient had to be operated upon or had a serious complication requiring acute care, the assessment was deferred until the crisis had passed.

Methodology

The investigators were initially content to spend time with the participants, gaining their trust and familiarity. Later, they were clearly explained the nature of the study, its objectives and benefits, while clarifying that there would be no implications for compensation or disability assessment for monetary benefit.

The baseline assessment included a diagnostic interview and review of case notes for a comprehensive, multi-axial diagnosis. This was to ensure that any medical or psychiatric illness detected during the period of study was appropriately managed regardless of the study objectives.

The participants were assessed using the Barthel's Index, the Hospital Anxiety and Depression Scale, the General Health Questionnaire, QOL index, AFMC stressful life event Scale and the Social Support Survey with the current defense or coping style also being recorded. Similar assessments were repeated at 1 month, 6 months, and at 1 year after intake.

Brief and salient features of the instruments referred to above are as follows:

a. The Barthel Index: Is the most widely used and respected as a good activities of daily living (ADL) scale intended for a long-term hospital patient, with paralytic conditions.[3] The 10-item version was used[4]

b. The social support survey: Offers a brief indication of social support, namely
   • Emotional support, love, and empathy
   • Provision of instrumental or tangible support for specific needs
   • Providing information, guidance, and feedback
   • Appraisal and self-evaluation support
   • Companionship in leisure and recreation.

The scale is designed for use in chronically ill patients and consists of 4 subscales – tangible support (items 2,
5, 12, and 15), affection (items 6, 10, and 20), positive social interaction (items 7, 11, 14, and 18), emotional or informational support (items 3, 4, 8, 9, 13, 16, 17, and 19). A total score is calculated from the mean of the subscale scores.[8]

c. The general health questionnaire: Is designed as a screen for psychiatric illness covering depression, anxiety, social impairment, and hypochondriasis. It is possibly the most extensively tested and validated of health instruments which according to one reviewer taps “an inner core of human suffering which can be reliably detected.”[9] The 12 items Hindi version was used, which has been validated in India.[7]
d. The AFMC Stressful Life Event Scale: Is a scale specifically developed for quantifying stressful life events in the Indian soldier and since its development has been found suitable for this purpose by different workers.[8]
e. The Hospital Anxiety Depression Scale: Detects anxiety and depression in the medically ill. It yields, anxiety and depression sub-scores with specific cut-off points for the absence and presence of significant anxiety and depressive symptoms warranting further, enquiry.[6]
f. The Quality of Life Index: Measures the general well-being of patients with chronic diseases. The theme of measurement is thus – activity levels, ADL, feelings of healthiness, quality of social support, and psychological outlook. It has been extensively used and validated as a global assessment of QOL, in seriously sick patients over the long-term.[10] Representative scores from healthy people range between 8.8 and 9.2, whereas the mean score for seriously ill patients is 3.30.

Follow-up
In the course the study, it was found that the number of patients available for assessment at 1 year or more was less because they were by then transferred to the paraplegic rehabilitation center (PRC) at Pune or Mohali. Hence, the PRC at Mohali was visited for the completion of data base of patients under follow-up (as well as a cross-sectional assessment of other long-stay patients already at the PRC). In this manner, an assessment of morbidity in some patients who had been injured more than a year earlier, was possible despite attrition of the original cohort, over this period.

Ethical issues
The study protocol was vetted and approved by the Armed Forces Medical Research Council for scientific value and for the qualifications of the researchers, to undertake the work. A locally constituted research ethics committee, which included the treating surgeon, head of the institution and other experienced clinicians, was also consulted. In the course of the study if clinical wisdom, established practice guidelines, suggested active psychotherapeutic and pharmacotherapeutic intervention, the same was instituted without delay. Overall, the Madrid Declaration on Ethical Standards for Psychiatric Practice was the anchoring document for ethical decisions.[11]

RESULTS

The assessment scores of the patients across time were tabulated and analyzed using parametric methods. As a first step, the mean scores and standard deviations were calculated, and these figures can be seen on [Tables 1a-d and 2a-c].

It was noticed that the mean scores on the Hospital Anxiety and Depression Scale were below the cut-off point for diagnosable disorder, or in the mild end of the spectrum. However, the other measures of psychological distress showed significantly high mean scores.

The next step was to ascertain the trends over time of these measures of morbidity and the putative modifying factors. Anxiety scores showed little variation over time initially and none of the mean differences (t values) reach statistical significance. However, when the scores of intake and those at 6 months are seen there is a statistically significant decrease.

Depression scores on the other hand showed a steady improvement with each assessment. In contrast, scores of general well-being and psychological distress, although they tended to follow the trend seen with anxiety symptoms initially, remained high at the end of a year. The QOL remained poor throughout the period of assessment.

The scores of environmental stress (AFMC stressful life event scale) after intake were high and showed a significantly diminuendo trend throughout the period of assessment. Clearly, the reducing trends observed in the psychological morbidity and well-being measures could not be accounted for by these environmental factors.

The overall impression was that though psychological distress was significant, psychiatric disorder was rare. Some measures of morbidity showed a decreasing trend over time while others remained poor throughout and neither could be accounted for by the variations seen in incident environmental stress scores.

The putative modifying factors’ scores were tabulated next, and the trends over time sought. This exercise is depicted
Table 1: Significance of mean differences in measures of psychological morbidity across time

| Parameter                  | 1 assessment | 2 assessment | 3 assessment | 4 assessment |
|----------------------------|--------------|--------------|--------------|--------------|
| (a) Anxiety scores         |              |              |              |              |
| Mean                       | 9.3          | 7.68         | 4.9          | 4.0          |
| SD                         | 5.29         | 4.35         | 3.0          | 3.60         |
| n                          | 20           | 16           | 10           | 3            |
| t                          | 0.96, df - 34, NS (between 1 and 2 assessments) | 1.82, df - 24, NS (between 2 and 3 assessments) | 0.49, df - 11, NS (between 3 and 4 assessments) | 3.25**, df - 28, Significant - 0.01 (between 1 and 3 assessments) |
| (b) Depression scores      |              |              |              |              |
| Mean                       | 9.75         | 8.37         | 5.6          | 5.0          |
| SD                         | 3.90         | 2.98         | 2.26         | 3.46         |
| n                          | 20           | 16           | 10           | 3            |
| t                          | 4.21**, df - 34, significant - 0.03 (between 1 and 2 assessments) | 2.48*, df - 24, significant - 0.05 (between 2 and 3 assessments) | 0.36, df - 11, NS (between 3 and 4 assessments) | 3.12**, df - 28, significant - 0.01 (between 1 and 3 assessments) |
| (c) GHQ Scores (subjective distress) |              |              |              |              |
| Mean                       | 6.25         | 6.12         | 3.7          | 8.6          |
| SD                         | 2.74         | 2.84         | 1.58         |              |
| n                          | 20           | 16           | 10           | 3            |
| t                          | 0.12, df - 34, NS (between 1 and 2 assessments) | 1.77, df - 24, NS (between 2 and 3 assessments) | 2.8*, df - 11, 0.05 (between 3 and 4 assessments) | 2.36*, df - 28, 0.5 (between 1 and 3 assessments) |
| (d) QOL Index              |              |              |              |              |
| Mean                       | 3.5          | 3.62         | 4.4          | 4.0          |
| SD                         | 1.79         | 2.21         | 2.64         |              |
| n                          | 20           | 16           | 10           | 3            |
| t                          | 0.001, df - 34, NS (between 1 and 2 assessments) | 0.82, df - 24, NS (between 2 and 3 assessments) | 0.26, df - 11, NS (between 3 and 4 assessments) | 1.20, df - 28, NS (between 1 and 3 assessments) |

* Significant; ** Highly Significant; NS – Not significant; SD – Standard deviation; GHQ – General Health Questionnaire; QOL – Quality of Life

Table 2: Significance of mean differences of environmental stressors, social support and disability measures across time

| Parameter                  | 1 assessment | 2 assessment | 3 assessment | 4 assessment |
|----------------------------|--------------|--------------|--------------|--------------|
| (a) Armed Forces Medical College Life events Scale (environmental stress) |              |              |              |              |
| Mean                       | 16.6         | 4.62         | 10.2         | 7.3          |
| SD                         | 5.43         | 5.86         | 6.97         | 2.12         |
| n                          | 20           | 16           | 10           | 3            |
| t                          | 6.33**, df - 34, 0.01 (between 1 and 2 assessments) | 2.19*, df - 24, 0.05 (between 2 and 3 assessments) | 0.69, df - 11, NS (between 3 and 4 assessments) | 2.77**, df - 28, 0.01 (between 1 and 3 assessments) |
| (b) Social support survey  |              |              |              |              |
| Mean                       | 56.45        | 56.12        | 51.4         | 46.3         |
| SD                         | 9.76         | 9.68         | 9.27         | 8.63         |
| n                          | 20           | 16           | 10           | 3            |
| t                          | 0.10, df - 34, NS (between 1 and 2 assessments) | 1.23, df - 24, NS (between 2 and 3 assessments) | 0.85, df - 11, NS (between 3 and 4 assessments) | 1.35, df - 28, NS (between 1 and 3 assessments) |
| (c) Barthel’s ADL Index    |              |              |              |              |
| Mean                       | 6.6          | 7.75         | 6.0          | 5.3          |
| SD                         | 4.16         | 6.09         | 4.98         | 5.78         |
| n                          | 20           | 16           | 10           | 3            |
| t                          | 0.67, df - 34, NS | 0.76, df - 24, NS | 0.20, df - 11, NS | 0.34, df - 28, NS |

*Significant; ** Highly Significant; ADL – Activities of daily living; NS – Not significant; SD – Standard deviation

in Table 2a-c. The scores reflect the severe disability and the abysmal QOL of the patients.

Next, the statistical significance of the variations over time was calculated. The degree of disability as measured by Barthel’s ADL Index showed no significant improvement over time reflecting the nature of the illness (injury followed by paralysis). The QOL similarly remained static during this period. Social support received by the patients appears to taper as time passes, although the trend is not statistically robust.
After ascertaining the magnitude of the variables and their variation over time, an effort was now made to find correlations between these variables. The figures are depicted in Table 3. Table 3 shows the coefficients of correlation between the morbidity measures (Anxiety, Depression, Stressful Life Events, Subjective Distress and Sense of Well-being) and the putative modifying variables (Disablement in ADL, QOL and Social Support).

There is a negative correlation between anxiety scores and QOL ($r = -0.55$) and a similar correlation between depression scores and QOL ($r = -0.59$) which approaches conventional significance levels between 1% and 0.1%.

It is thus observed that notwithstanding the absence of anxiety and depressive disorders in this sample, sub-syndromal anxiety and depressive symptoms could have a significant impact on the QOL and warrant intervention. This is in consonance with the findings of other workers.[13]

The expected correlation between psychological morbidity, disablement, and social support was not demonstrable in the acute-phase assessment and in subsequent assessments possibly due to inadequate sample size.

It is however possible that, patients with different levels of disability suffer from a similar degree of psychological distress in the acute phase. The implication in such a scenario is that even patients with a lesser degree of disability (e.g., Para paresis and incomplete lesions) are as vulnerable to psychopathology as those with severe disability (e.g., quadriplegia).

The abysmal QOL at the acute stage is contributed to by the loss of functional independence (and consequent grief), loss of role function, pain, muscle spasms, bowel and bladder pathology. In this context, it is easier to understand how social support could be useful only in reducing perceived environmental stress. It should however be mentioned that the sample consisted of soldiers being assessed in a hospital setting far away from their homes. Consequently, they rated items relating to emotional support, guidance, companionship, and empathy as deficient; though they felt that tangible/instrumental support was adequate.

At 6 months–1 year, the patient’s expectations are of wellness and not merely survival, or the lack of pain and illness. Therefore, a significant correlation between degree of disability and subjective distress starts emerging only after this point. Interventions to reduce the degree of disability such as provision of vocational training, assistive devices for independence would be more appropriate at this stage rather than psychological therapies. This observation is in accord with other workers.[13]

**DISCUSSION**

The psychological consequences of SCI have interested workers in the field from the beginning and a 1978 paper by Stewart describes denial and depression as essential stages of the adaptive process.[14] However, later workers questioned this assumption and suggested that perhaps diagnosable depression was less than that expected in these patients.[15] A landmark study published in the Archives of General Psychiatry in December 1981 used rigorous operational criterion for psychiatric illness in these patients. They found that SCI did not necessarily result in psychiatric illness. There was a past history of psychopathology even in those who did develop psychiatric illness. They concluded that psychiatric illness warranting formal referral and care was in fact rare.[16]

These findings were replicated by Judd et al., though slightly larger numbers were seen to need and were exhibited antidepressant medication.[17] Their concept of depressed mood not amounting to a depressive disorder being common in SCI, was validated by a systematic prospective study done later by the same workers; in which a majority of patients showed no clear evidence of depression, a larger number showed transient depressed mood and 14 out of 71 patients met criteria for a depressive episode.[18]

Similarly, a large-scale study carried out in India also noted neurotic symptoms to be virtually universal but depressive illness only in about 11%.[19]

Tirch et al. have compared 11 pairs of monozygotic twins where one of each pair was injured. There were no significant differences in depressive symptoms suggesting further that a depressive illness is not more common in those with SCI.[20] Hancock et al. had already sought to further quantify the issue by comparing objective increase of depression and anxiety over the 1st year of SCI with able-bodied controls. Although the SCI group was more anxious and depressed, they reported that the group’s

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**Table 3: Co-efficients of correlation between morbidity and modifying factors at intake**

| Morbidity measure | QOL Index ($r$) | Social support survey ($r$) | Barthel’s ADL Index ($r$) |
|------------------|----------------|---------------------------|-------------------------|
| Anxiety          | -0.55          | -0.12                     | -0.36                   |
| Depression       | -0.59          | -0.14                     | -0.38                   |
| Life events      | -0.16          | -0.87                     | -0.10                   |
| GHQ (subject distress) | -0.10 | -0.28 | -0.33 |

ADL – Activities of daily living; GHQ – General Health Questionnaire; QOL – Quality of Life
means of scores reflected mild levels of depression and anxiety.\textsuperscript{[21]} The present study has also found this to be valid with over-all anxiety and depression scores being in the mild range over the period of 1 year.

The same authors, further noted that pain management and rehabilitation techniques could reduce depression in these patients while noting that degree of disability, was not related to long term depression.\textsuperscript{[22]} The present study has also found this to be true. The latest studies on this population have gone on to focus on the influence of the psychological factors of other SCI pathology such as pain,\textsuperscript{[23]} bladder control\textsuperscript{[24]} and also on coping strategies.\textsuperscript{[25]}

The poor QOL in these patients was demonstrated with the help of matched controls by Dahlberg \textit{et al}. They drew attention to the importance of psychological interventions in improving it.\textsuperscript{[24]} The present study also found psychological symptoms to be significantly related to the QOL.

Social support and recent stressor were identified as significant factors by Boekamp \textit{et al}. They proposed a stress-diathesis model predictive of psychiatric illness.\textsuperscript{[27]} The present study results however did not validate this in our population although this could be due to inadequate sample size.

**CONCLUSION**

Overall the findings of this study are in accord with the current understanding of the psychological illness spectrum in SCI. Although psychological symptoms of depressive and anxious spectrum was virtually universal, psychiatric illness at syndromal intensity warranting a formal psychiatric referral and management was rare in patients with SCI in the first year. The general well-being and QOL was expectedly dismal throughout. Expected correlations between measures of social support and degree of disability with measures of anxiety, depression, subjective distress and QOL were not demonstrated. There is a need to look beyond these and explore factors such as lack of information, physical morbidity, quality of social support and dependence for ADL in order to evolve a nuanced approach towards the challenge that these clientele represent.

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**Conflicts of interest**

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