

Mechanism-based Classification and Physical Therapy Management of Persons with Cancer Pain: A Prospective Case Series

Senthil P Kumar, Krishna Prasad¹, Vijaya K Kumar, Kamalaksha Shenoy²,
Vaishali Sisodia³

Departments of Physiotherapy, ¹Medical Oncology, ²Radiation Oncology, Kasturba Medical College, Manipal University, ³Post-graduate student, Srinivas College of Physiotherapy, Mangalore, India

Address for correspondence: Assoc. Prof. Senthil P Kumar; E-mail: senthil.kumar@manipal.edu

ABSTRACT

Context: Mechanism-based classification (MBC) was established with current evidence and physical therapy (PT) management methods for both cancer and for noncancer pain.

Aims: This study aims to describe the efficacy of MBC-based PT in persons with primary complaints of cancer pain.

Settings and Design: A prospective case series of patients who attended the physiotherapy department of a multispecialty university-affiliated teaching hospital.

Material and Methods: A total of 24 adults (18 female, 6 male) aged 47.5 ± 10.6 years, with primary diagnosis of heterogeneous group of cancer, chief complaints of chronic disabling pain were included in the study on their consent for participation. The patients were evaluated and classified on the basis of five predominant mechanisms for pain. Physical therapy interventions were recommended based on mechanisms identified and home program was prescribed with a patient log to ensure compliance. Treatments were given in five consecutive weekly sessions for five weeks each of 30 min duration.

Statistical Analysis Used: Pre–post comparisons for pain severity (PS) and pain interference (PI) subscales of Brief pain inventory–Cancer pain (BPI-CP) and, European organization for research and treatment in cancer-quality of life questionnaire (EORTC-QLQ-C30) were done using Wilcoxon signed-rank test at 95% confidence interval using SPSS for Windows version 16.0 (SPSS Inc, Chicago, IL).

Results: There were statistically significant ($P < 0.05$) reduction in pain severity, pain interference and total BPI-CP scores, and the EORTC-QLQ-C30.

Conclusion: MBC-PT was effective for improving BPI-CP and EORTC-QLQ-C30 scores in people with cancer pain.

Key words: Cancer pain, Pain mechanisms, Palliative care, Physical therapy

INTRODUCTION

Cancer is the common condition in which addressing pain relief is often the leading concern for the patient and palliative care team at end-of-life care.^[1] Every year, approximately 4.5 million patients die from cancer,

and 3.5 million suffer from cancer pain daily, with only a limited number of them receiving adequate pain treatment.^[2]

The pain in cancer patients may be caused by direct tumor involvement, diagnostic or therapeutic procedures, side effects, or toxicities of cancer treatment. Regardless of its source, uncontrolled pain can affect every aspect of a patient's quality of life, causing suffering, interference with sleep, and reduced physical and social activity and appetite.^[3] Though specialist palliative care teams are available for treating cancer pain, the deaths due to cancer pain are alarmingly at 28%.^[4]

Access this article online

Quick Response Code:



Website:
www.jpalliativecare.com

DOI:
10.4103/0973-1075.110225

In India, in a study cohort of 156 patients who were receiving radiotherapy for their cancer pain, 61% had incidence of pain.^[5] Bisht *et al.*,^[6] found that pain was the most common prevalent symptom (96% of 100 patients assessed) among cancer patients attending a palliative care unit in Uttarakhand, India.

World Health Organization (WHO) analgesic ladder management is currently the most accepted and widely employed pain management strategy in patients with cancer pain. Despite their well-known adverse effects ranging from local to general in bodily distribution, opioids are still the most recommended drug therapy of choice for patients with cancer pain.^[7] Despite great advances in the fields of pain management and palliative care, pain directly or indirectly associated with a cancer diagnosis remains significantly undertreated.^[8]

Nonpharmacologic methods used in conjunction with analgesics have as their goal to help the patient with cancer gain or maintain functionality and restore a sense of psychological control over their pain and their circumstances. These approaches ordinarily have no negative side effects.^[9] Physical interventions form a part of nonpharmacological interventions that include a variety of therapeutic methods for pain relief in palliative care, administered by physical therapists.^[10]

One of the recent developments in conceptualization of physical therapy management for pain relief in palliative care is the mechanism-based classification of pain.^[11] Identification of a cancer patient's clinical presentation and its relationship to symptoms is essential for initiation of appropriate therapeutic strategy for pain relief.

There are five operating mechanisms in pain perception that are categorized under mechanism-based classification (MBC) of pain by Kumar and Saha,^[11] who described in detail the individual mechanisms, their clinical features, assessment findings, and probable physical therapy (mechanism-based physical therapy-MBPT) treatment techniques. Recently, Kumar^[12] described the application of MBC and MBPT to cancer pain. The five mechanisms are:

- Central sensitization/central neurogenic mechanism/central nociceptive mechanism
- peripheral sensitization/peripheral neurogenic mechanism
- peripheral nociceptive mechanism
- sympathetically maintained pain/sympathetically dependent pain mechanism and
- cognitive–affective (psychosocial) mechanism.

The recent paradigm shift toward mechanisms of musculoskeletal pain^[13] and MBPT indicates a

comprehensive therapeutic decision-making process^[14] by identifying the predominant pain mechanism and future mechanism-specific physical therapy treatments. Although the WHO analgesic ladder is the most widely recommended treatment of choice for cancer pain,^[15] controlled clinical trials are lacking.^[15,16] A recent position statement of British Pain Society endorsed by the UK Association of Palliative Medicine and the Royal College of General Practitioners on physical, interventional, and complementary therapies emphasized a more comprehensive model of managing cancer pain was needed that was mechanism based and multimodal, using combination therapies including interventions where appropriate, tailored to the needs of an individual, with the aim to optimize pain relief with minimization of adverse effects.^[17] The objective of this study was to detail the efficacy^[18] of MBPT in addition to standard intervention of WHO analgesic ladder prescription, for pain in patients with cancer.

MATERIALS AND METHODS

Study design

Observer-blinded prospective case series.

Study location

Department of physiotherapy, Kasturba medical college (Manipal University), Mangalore.

Study setting

KMC hospital, Attavar, Mangalore – an in-patient ward and out-patient physiotherapy unit in a multispecialty, university-affiliated teaching hospital.

Sampling

Convenient sampling.

Subjects

Hospitalized or out-patient adult patients of either gender medically diagnosed with cancer as a primary diagnosis, which were referred for rehabilitation and symptom palliation to physical therapy.

Selection criteria

The patients were considered for participation in this study if they had the following inclusion criteria:

Cancer as a primary diagnosis for a minimum of 6 months and pain as a primary symptom for a minimum of 3 months.

The patients with following presentations were excluded from the study:

Secondary comorbid diagnoses of neurological, musculoskeletal, psychiatric, cardiopulmonary disorders, skin disorders, which would affect physical therapy examination and treatment.

Procedure

All patients were required to provide a written informed consent prior to participation and screening.

Categorization of pain in patients with cancer

At the first level, cancer pain will be categorized under three broad categories, by referring physician or medical oncologist and/or radiation oncologist, respectively, into each of the following.^[13]

- Pain unrelated to cancer (noncancer pain) – pain in areas anatomically unrelated to the region of carcinoma; intermittent pain aggravated/relieved by positions and/or movements; pain that was present much before the diagnosis of cancer; and, pain that do not respond to cancer treatments.
- cancer-related pain (primary cancer pain), which will be further subgrouped into breakthrough (refractory/incidental) pain and nonbreakthrough pain. Cancer-related pain – pain in the region of carcinoma; pain that started after cancer diagnosis; constant pain of high intensity that usually responds to anticancer treatments.
- cancer treatment-related pain (secondary cancer pain) – pain after initiation of anticancer treatments such as chemotherapy (e.g., neuropathy), radiation therapy (e.g., mucositis), or surgery (e.g., postoperative pain).

Categorization of patients' pain into five mechanisms

A qualified physical therapist would classify the patient's pain into following five mechanisms and also rate and rank the predominant mechanism operating for pain in the patient. The detailed description of MBC for cancer pain is provided elsewhere.^[12]

Intervention

Mechanism-based physical therapy

The following mechanism-specific treatments were administered by a physical therapist and a clinical psychologist.

Cognitive-affective

Pain education emphasizing on pain–disability interrelationship, stress and pain, pacing, graded activity

training, and cognitive-behavioral therapy. An attempt to explore the patient's own understanding of pain and related symptoms into locus of control was done to improve coping behavior and positive self-monitoring approach to pain.

Central sensitization

Pain neurophysiology education and low-frequency transcutaneous electrical nerve stimulation (TENS) applied to the painful area.

Peripheral sensitization

Sciatic nerve press technique, peripheral nerve massage, and peripheral nerve slider techniques.

Sympathetically maintained pain

Sympathetic slump technique performed for the thoracic region with the patient in long sitting position. Thoracic spinal mobilization was performed additionally if restricted mobility was found on passive motion testing of the spine.

Nociceptive

High-frequency TENS, soft tissue mobilization/massage, passive/active-assisted/free-active/resisted exercises.

The intervention was administered once weekly for a period of five weeks, with each session lasting 30 min.

All patients were also on WHO analgesic ladder for their cancer pain, which was first proposed in 1986 as a guideline and later updated in 1997,^[19] which was later validated^[20] and recommended by palliative care associations and associations of radiation oncologists^[21] and endorsed by guidelines^[22] for its use as an effective therapeutic strategy in management of pain in patients with cancer.

Outcome measures

Pain

Brief pain inventory for cancer pain (BPI-CP)^[23] consisting of pain severity and pain interference subscales was used as a self-report measure for evaluating pain and associated activity limitations due to cancer pain. The Brief Pain Inventory (BPI) is recommended as a pain measurement tool by the Expert Working Group of the European Association of Palliative Care.

The first part of the BPI measures pain severity using four different 11-point numeric scales anchored by 0 representing “no pain” and 10 being “pain as bad as you can imagine.” Patients are instructed to rate their pain now and worst for the past 24 h, least for the past 24 h, and average pain. The second part of the BPI

measures how pain interferes with general activity, mood, walking, normal work, relationships with others, sleep, and enjoyment of life. Similar to pain severity, each functional item is ranked on an 11-point numeric scale, where 0 represents “Does not interfere” and 10 denotes “completely interferes.” The sum of the scores of the pain intensity items represents the summed pain intensity score, and the sum of the scores on the pain interference items represents the summed interference score. Because BPI has no validated method for handling missing values, the summed scores were not calculated for patients with missing values.

Quality of life

Was measured using generic and disease-specific components of European organization for research and treatment in cancer quality of life questionnaire 30-item (EORTC-QLQ C30).^[24] Both patient- and caregiver-reported versions were taken. It has high reliability and validity in different groups of cancer patients and the test–retest reliability is optimal. The questionnaire consists of 30 items. It is composed of five functional scales (physical, role, emotional, cognitive, social), three symptom scales (fatigue, pain, nausea/vomiting), and eight single items (global health, global quality of life, dyspnea, appetite loss, sleep disturbance, constipation, diarrhea, and financial impact of the disease and treatment).

Data Collection

Outcome measures were taken pre- and post-treatment by an independent blinded observer who was a qualified physiotherapist.

Data Analysis

Sample size estimation was done through anticipated effect size, desired statistical power, and level of probability using an online sample size calculator.^[25] Pre–post comparison for both outcome measures for total scores and subscores was done using Wilcoxon signed-rank test at 95% confidence interval using Statistical Package for Social Sciences (SPSS) version 16.0 for Windows (SPSS Inc., Chicago, IL, USA).

RESULTS

Sample size estimation

For an effective size of 1.5 (substantial) under a desired power level of 90% with a level of probability set at 5%, we calculated *a priori* sample size for this study to be 22

with a two-tailed hypothesis. Including a possible 10% dropout, we thus needed to recruit 24 patients.

Demographic characteristics

There was a series of 24 patients whose demographic characteristics are shown in Table 1.

Primary outcomes

The MBC findings for those patients are shown in Table 2 and the pre–post comparisons for the two measures (BPI and EORTC-QLQ-C30) with their subscales are shown in Table 3.

DISCUSSION

The study is the first of its kind, conducted on patients with cancer pain where the treatment was based on the identified predominant mechanism of pain. While mechanisms were found to play an important role not only in therapeutic responses but also in pathogenesis of pain *per se*, the notable changes in outcome measures of pain and quality of life measured using BPI-CP and EORTC-QLQ-C30 were much beyond the substantial effective sizes for both the measures. This change was associated with 100% statistical power, which adds to the external validity of this study’s findings. There were thus clinically significant improvements together with the statistical significance. The choice of these two outcome measures would have determined the accuracy of the observed change since they were chosen based on earlier reports of their established measurement properties and evidence-based recommendations on their use.^[23,24] This study findings are based on a small sample size and hence caution is warranted prior to extrapolation of its findings into patient populations with cancer pain.

The decision making in MBPT is open for further scrutiny since the classification is recently under preliminary validation and is yet to be comprehensively established. However, other methods of clinical decision making^[26] for management of patients with cancer pain are open for future research and comparisons between different approaches would yield better clinically relevant information.

One of the acceptable limitations and of probable consideration is the patient heterogeneity in the etiological diagnosis for cancer pain. This study included bone cancer, breast cancer, head and neck cancer, and lung cancer and inclusion of other types would yield different results, and

Table 1: Descriptive characteristics of the study sample

Variable	Category	Values, n (%)
Total sample size, n		24
Age (years)		47.5±10.6
Gender	Male	6 (25)
	Female	18 (75)
Region of symptoms	Neck and upper limb	9 (37.5)
	Shoulder and arm	3 (12.5)
	Lumbar spine and lower extremity	6 (25)
	Knee and patello-femoral joint	6 (25)
Type of Cancer	Bone cancer	9 (37.5)
	Breast cancer	6 (25)
	Head and neck	6 (25)
	Lung cancer	3 (12.5)
Prescribed analgesic drug therapy	Yes	24 (100)
	No	0 (0)
Radiotherapy	Yes	15 (62.5)
	No	9 (37.5)
Chemotherapy	Yes	15 (62.5)
	No	9 (37.5)
Surgery	Yes	15 (62.5)
	No	9 (37.5)
Characteristic of cancer pain	Organic	24 (100)
	Nonorganic	0 (0)
Nature of cancer pain	Constant	9 (37.5)
	Intermittent	12 (50)
	Both (mixed)	3 (12.5)
Area of cancer pain	Localized	12 (50)
	Generalized	12 (50)
Location of cancer pain	Superficial	12 (50)
	Deep	12 (50)
Type of cancer pain	Somatic	24 (100)
	Visceral	0 (0)
Duration of cancer pain	Acute	6 (25)
	Chronic	18 (75)
Intensity of cancer pain	Mild	3 (12.5)
	Moderate	12 (50)
	Severe	9 (37.5)
Irritability of cancer pain	Mild	21 (87.5)
	Moderate	3 (12.5)

All values are in numbers (percentages)

future research on MBPT could study homogeneous types of cancer patients and their therapy responses.

There were mixed findings obtained from patient history findings in terms of pain presentations as most of the patients had cancer treatment-related pain rather than cancer-related pain. Also it is important to note that all patients were already on analgesics prescribed on symptomatic basis as outlined by the WHO and hence MBPT effects could be opined better as an useful adjunct to drug therapy.

Table 2: Prevalence of mechanism-based subgroups amongst patients

Mechanism-based classification of cancer pain	
Cognitive-affective Yes (%), No (%)	15 (62.5%), 9 (37.5%)
Central sensitization Yes (%), No (%)	12 (50%), 12 (50%)
Sympathetically maintained pain Yes (%), No (%)	24 (100%), 0 (0%)
Nociceptive Yes (%), No (%)	24 (100%), 0 (0%)
Peripheral neurogenic Yes (%), No (%)	12 (50%), 12 (50%)
Prevalence of mechanism-based subgroups in cancer pain	
Cognitive-affective	12.5±20%
Central sensitization	6.87±10.32%
Sympathetically maintained pain	0%
Nociceptive	62.5±34.84%
Peripheral neurogenic	18.12±22.66%

All values are in mean and standard deviations

Some of the important observations of this study include: Prevalence of nociceptive mechanism was greater than peripheral sensitization and cognitive–affective mechanism in cancer pain. This trend was similar to findings in patients with musculoskeletal pain found earlier,^[27] hence there is a possibility that these patients' pain was predominantly musculoskeletal in origin, which was evidenced by intermittent nature and mild irritability. Breakthrough pain was not considered in this study, which might not have responded to MBPT or was originally not intended to be used for.

Future controlled studies on comparison of individual versus mechanism-based treatments may be warranted in other medical and nonmedical therapeutic interventions. Another factor evaluated in this study was the effects and not the effectiveness *per se*,^[18] the latter needs to be evaluated using large-scale, population-based, pragmatic, randomized, clinical trials.

CONCLUSION

Mechanism-based physical therapy produced clinically and statistically significant change in BPI-CP and EORTC-QLQ-C30 scores among people with cancer pain in this study.

ACKNOWLEDGEMENT

The authors wish to thank patients and their family caregivers for their whole-hearted participation in the study.

Table 3: Pre–post comparisons of total and subscale scores of brief pain inventory and European organization for research and treatment in cancer quality of life questionnaire 30-item questionnaire

Outcome measure	Subscales	Pre-treatment	Post-treatment	Statistical power (%)	Effect size (Cohen's D)
Brief pain Inventory-cancer pain	Pain severity subscale (PS)	28.25±2.71	15.12±2.35	-	5.17
	Pain interference subscale (PI)	47±3.02	25±4.62	-	5.63
	Total score	75.25±3.77	40.12±4.08	100	8.94
EORTC-QLQ-C-30 Questionnaire	Global health status/quality of life	42.5±9.1	68±6.59	-	3.20
	Physical functioning (a)	69.62±4.27	88±4.4	-	4.23
	Role functioning (b)	57±4.47	86.87±9.41	-	4.05
	Emotional functioning (c)	64.12±3.56	85.25±3.37	-	6.09
	Cognitive functioning (d)	72±3.42	90±8.43	-	2.79
	Social functioning (e)	68.87±4.42	87.87±6.72	-	3.34
	Functioning subscale (a+...e)	331.62±9.75	438±12.04	100	9.71
	Fatigue (f)	52.5±2.07	23.62±3.85	-	9.34
	Nausea and vomiting (g)	14.5±1.06	13.5±0.92	-	1.00
	Pain (h)	48±1.3	15.62±2.5	-	16.25
	Dyspnea (i)	28.62±2.13	17.62±3.81	-	3.56
	Insomnia (j)	27±1.77	17±1.3	-	6.43
	Appetite loss (k)	25.87±2.58	17.75±1.03	-	4.13
	Constipation (l)	23.87±1.45	17.12±1.35	-	4.81
	Diarrhea (m)	10.75±2.49	5.5±1.6	-	2.50
Financial difficulties (n)	28.25±2.31	13.87±2.23	-	6.33	
Symptoms subscale (f+...n)	259.38±6.32	141.62±9.3	100	14.81	

All values are in means and standard deviations; *-P values for all comparisons were significant at <0.0001 level; EORTC-QLQ-C-30, European organization for research and treatment in cancer quality of life questionnaire 30-item

REFERENCES

- Nair SN, Mary TR, Prarthana S, Harrison P. Prevalence of pain in patients with HIV/AIDS: A cross-sectional survey in a south Indian state. *Indian J Palliat Care* 2009;15:67-70.
- Murthy NS, Mathew A. Cancer epidemiology, prevention and control. *Curr Sci* 2004;86:518-27.
- Brawley OW, Smith DE, Kirch RA. Taking action to ease suffering: Advancing cancer pain control as a healthcare priority. *CA Cancer J Clin* 2009;59:285-9.
- Bhatnagar S. Interventional pain management: Need of the hour for cancer pain patients. *Indian J Palliat Care* 2009;15:93-4.
- Sharma K, Mohanti BK, Rath GK, Bhatnagar S. Pattern of palliative care, pain management and referral trends in patients receiving radiotherapy at a tertiary cancer center. *Indian J Palliat Care* 2009;15:148-54.
- Bisht M, Bist SS, Dhasmana DC, Saini S. Palliative care in advanced cancer patients in a tertiary care hospital in Uttarakhand. *Indian J Palliat Care* 2008;14:75-9.
- Ripamonti C, Dickerson ED. Strategies for the treatment of cancer pain in the new millennium. *Drugs* 2001;61:955-77.
- Myers J, Shetty N. Going beyond efficacy: Strategies for cancer pain management. *Curr Oncol* 2008;15(Suppl 1):S41-9.
- Guptill WE, Carr DB. Cancer pain assessment and management: A survey. *J Back Musculoskeletal Rehabil* 1999;12:89-99.
- Kumar SP, Jim A. Physical therapy in palliative care: From symptom control to quality of life: A critical review. *Indian J Palliat Care* 2010;16:138-46.
- Kumar SP, Saha S. Mechanism-based classification of pain for physical therapy in palliative care: A clinical commentary. *Indian J Palliat Care* 2011;17:80-6.
- Kumar SP. Cancer pain: A Critical Review of Mechanism-based Classification and Physical Therapy Management in Palliative Care. *Indian J Palliat Care* 2011;17:116-26.
- Kumar SP. Musculoskeletal pain- moving from symptoms and syndromes to mechanisms. *J Phys Ther* 2011;2:41-5.
- Kumar SP. Treatment planning and decisions for therapy: How and why? *J Phys Ther* 2011;3:1-3.
- Azevedo São Leão Ferreira K, Kimura M, Jacobsen Teixeira M. The WHO analgesic ladder for cancer pain control, twenty years of use. How much pain relief does one get from using it? *Support Care Cancer* 2006;14:1086-93.
- Jadad AR, Browman GP. The WHO analgesic ladder for cancer pain management. Stepping up the quality of its evaluation. *JAMA* 1995 20;274:1870-3.
- Raphael J, Hester J, Ahmedzai S, Barrie J, Farquhar-Smith P, Williams J, *et al.* Cancer pain: Part 2: Physical, interventional and complimentary therapies; management in the community; acute, treatment-related and complex cancer pain: A perspective from the British Pain Society endorsed by the UK Association of Palliative Medicine and the Royal College of General Practitioners. *Pain Med* 2010;11:872-96.
- Kumar SP. Effects, efficacy, efficiency, effectiveness in physical therapy: How far are we? *J Phys Ther* 2011;3:33-7.
- Mercadante S, Fulfaro F. World health organization guidelines for cancer pain: A reappraisal. *Ann Oncol* 2005;16(Suppl 4):iv132-5.
- Zech DF, Grond S, Lynch J, Hertel D, Lehmann KA. Validation of World Health Organization Guidelines for cancer pain relief: A 10-year prospective study. *Pain* 1995;63:65-76.
- The management of chronic pain in patients with breast cancer. The Steering Committee on Clinical Practice Guidelines for the Care and Treatment of Breast Cancer. Canadian Society of Palliative Care Physicians. Canadian Association of Radiation Oncologists. *CMAJ* 1998;158(Suppl 3):S71-81.
- Control of pain in adults with cancer: Summary of SIGN guidelines. *BMJ* 2008;337:a2154. Available from: <http://www.bmj.com/content/337/bmj.a2154.full> [Last accessed on 2012 May 30].
- Kumar SP. Utilization of brief pain inventory as an assessment tool for pain in patients with cancer: A Focused Review. *Indian J Palliat Care* 2011;17:108-15.
- Aaronson NK, Ahmedzai S, Bergman B, Bullinger M, Cull A, Dues NJ, *et al.* The European Organisation for Research and Treatment of Cancer QLQ-C30: A quality-of-life instrument for use in international clinical trials in oncology. *J Natl Cancer Inst* 1993;85:365-76.
- Soper, D.S. (2012) Effect Size (Cohen's d) Calculator for a Student t-Test (Online Software), Available from: <http://www.danielsoper.com/>

statcalc3 [Last accessed on 2012 May 30].

26. Kumar SP. Treatment planning and decisions for therapy- how and why? J Phys Ther 2011;3:1-3.
27. Kumar SP. Prevalence of mechanism-based subgroups among patients with musculoskeletal pain- a cross-sectional study. Physiotimes 2010;2:26-32.

How to cite this article: Kumar SP, Prasad K, Kumar VK, Shenoy K, Sisodia V. Mechanism-based classification and physical therapy management of persons with cancer pain: A prospective case series. Indian J Palliat Care 2013;19:27-33.

Source of Support: Nil. **Conflict of Interest:** None declared.

Announcement

Android App



Download
**Android
application**

FREE

A free application to browse and search the journal's content is now available for Android based mobiles and devices. The application provides "Table of Contents" of the latest issues, which are stored on the device for future offline browsing. Internet connection is required to access the back issues and search facility. The application is compatible with all the versions of Android. The application can be downloaded from <https://market.android.com/details?id=comm.app.medknow>. For suggestions and comments do write back to us.

Copyright of Indian Journal of Palliative Care is the property of Medknow Publications & Media Pvt. Ltd. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.