

LOW BACK PAIN

AN OVERVIEW IN THE GOLD MINING INDUSTRY IN SOUTH AFRICA

■ by Regina C Bester BSc Physiotherapy
(UOVS)

INTRODUCTION

According to studies done in the USA in 1993, researchers came to the following conclusions:

Low back pain (LBP) is the leading cause of disability for people under 45 years of age and it is the second leading cause of industrial absenteeism, upper respiratory tract infections being the major cause¹. About 60% of all employees experience some LBP at some time in their employment careers. Although 90% of these employees experience relatively short episodes of incapacitation, long-term (more than 4 weeks) or permanent disability resulting from LBP develops in 10% of employees². Disability due to LBP increased at a rate 14 times the population growth between 1957 and 1976. This increase was much greater than for disability due to other causes¹.

To prevent chronic cases of disabling occupational LBP, it must be known not only why some employees experience LBP, but also why some get better after a short period and others do not. Despite four decades of research on spinal disorders, the determinants of long term disability associated with LBP essentially are unknown. The studies that do exist have one thing in common: physical examinations, biomechanical factors and medical diagnosis have little predictive value regarding return to work but a range of psychosocial factors seem to be significantly involved in the disabling process².

The hypothesis exists that factors other than the spine itself play an important role in the disabling process of LBP. An increasing body of literature suggests that occupational disability is a result of multiple risk factors related to the individual, the work environment, the non-occupational social environment, the medical system, the legal system, the systems of workers' compensation disability insurance and the economic environment, including social security and welfare¹.

Although most of the current research is being done in other industries, very little is known about the occurrence of LBP in the mining industry and especially in South Africa. Risk factors in the

ABSTRACT

An analysis of the occurrence of low back pain in the Gold Mining Industry was done retrospectively by the author for a period of one year using the patients' physiotherapy treatment cards for information. The most common mechanism of injury was identified as spontaneous onset of low back pain and the highest risk occupations were drillers, mining team and scraper/winch operators. The treatment protocol which the Physiotherapy department follows as well as the outcome of the programme are described.

ABSTRAK

Die skrywer het 'n retrospektiewe analise van die voorkoms van lae rugpyn in die goudmynbou industrie gedoen vir 'n tydperk van een jaar waar die pasiëntkaarte gebruik is vir inligting. Die mees algemene meganisme van besering is geïdentifiseer nl. spontane ontstaan van rugpyn en die hoë risiko werk groepe was booroperateurs, mynbouspan werkers en skrapeer/wenas operateurs. Die behandelingsprotokol wat deur die fisioterapie departement gevolg word, word beskryf asook die uitkoms van die program.

mining industry could be sub-grouped as ergonomic (workplace design, physical workload, vibration) organisational (shift system, job strain, quality of supervisory support) or motivational (job satisfaction).

In order to make an informed decision on where to direct our resources, the author has looked at the occurrence of LBP amongst the patients treated at the Freegold Health Service - Physiotherapy Department.

LITERATURE REVIEW

Mining Industry:

General consensus throughout the literature is that the major reason for the high prevalence and incidence of low back pain in this industry is biomechanical stress developed during the lifting and transferring of heavy objects³. Additional areas of concern are the asymmetrical trunk positions and unpredictable velocities that accompany heavy-object-moving activities. Another factor is the prolonged effect of vibration on the spine.

It was found by Genaidy *et al* (1993)⁴ that factors including age, gender, body weight and spinal component explained between 42% and 74% of the variation in compressive strength of the lumbar spine. The compressive strength of the spine was found to decrease by 10% to 20% with each decade of life beyond 29 years. Compressive strength was also found to increase with an increase in body weight.

It is widely accepted that injuries occur when the physical demands of a job exceed a worker's strength. In order to establish problem areas in the mining industry, the author has investigated all patients with back pain treated as outpatients in the physiotherapy department at the Ernest Oppenheimer Hospital (total of 267 patients) from May 1994 to May 1995.

Anatomic/Physiologic origins of findings in the low back

Low back pain may arise from several structures in the lumbar spine, including the ligaments that interconnect vertebrae, outer fibres of the annulus fibrosus, facet joints, vertebral periosteum, paravertebral musculature and fascia, blood vessels and spinal nerve roots⁵. The causes of low back pain generated through these structures include:

- 1) musculoligamentous injuries
- 2) degenerative changes in the intervertebral discs and facet joints
- 3) herniation of the nucleus pulposus of an intervertebral disc, with irritation of adjacent nerve roots
- 4) spinal stenosis (this usually results from hypertrophic degenerative changes in the discs, ligamentum flavum and facet joints)
- 5) anatomic anomalies of the spine eg (scoliosis)
- 6) underlying systemic disease
- 7) visceral diseases unrelated to the spine.

Prevalence of diseases that produce low back pain

Up to 85% of patients cannot be given a definitive diagnosis because of weak associations amongst symptoms, pathological changes and imaging results. We assume that many of these cases are related to musculoligamentous injury or degenerative

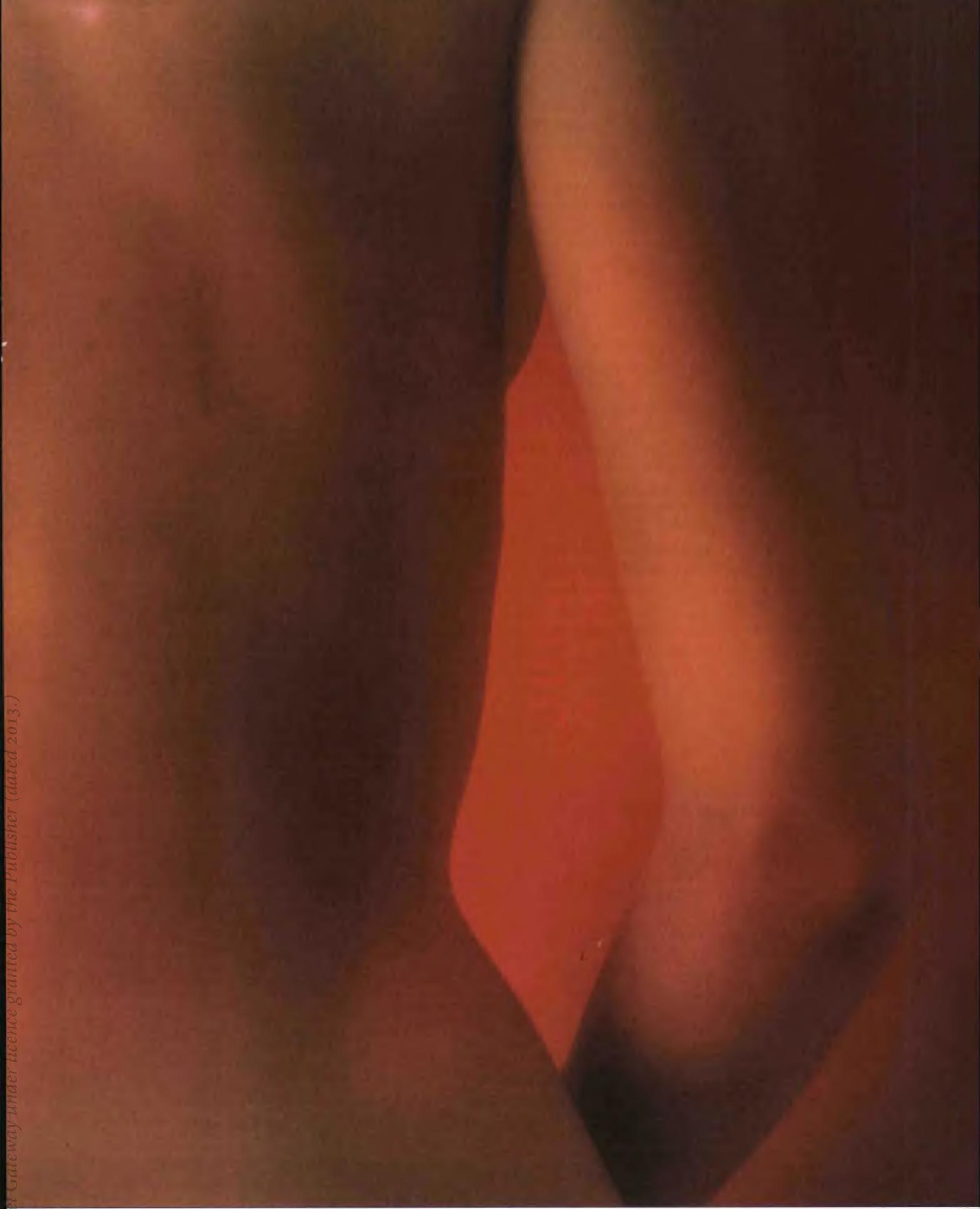
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changes. Anatomic evidence of a herniated disc is found in 20% to 30% of imaging tests among normal persons². These herniations are asymptomatic and result in no clinical disease. Since a specific cause frequently cannot be identified, diagnostic efforts are often disappointing. Instead of seeking a precise cause in every case of back pain, it may be most useful to answer three basic questions.⁶

- 1) Is there a serious systemic disease causing the pain?
- 2) Is there neurologic compromise that might require surgical evaluation?
- 3) Is there social or psychological distress that may amplify or prolong pain?

These questions can generally be answered on the basis of history and physical examination alone and a minority of patients require further diagnostic testing.

Is there evidence of social or psychological distress that may amplify or prolong pain?

Deyo *et al*² came to the conclusion that some features of patient history influence management regardless of the exact spinal pathology. Chronic pain and depression may be indications for the use of anti-depressant medication rather than opiates. Alcohol or drug abuse influences the choice of medications and requires specific intervention. Disability compensation claims or litigation may affect initial evaluation and prognosis and patients seeking compensation often respond poorly to a variety of treatments.

Patients with chronic low back pain (3 months duration) present complex problems and often a pathoanatomic cause is not apparent. Unlike acute pain, chronic pain often is not associated with on-going tissue injury, serves no biological usefulness and is not accompanied by the autonomic response of sympathetic over-activity. Vegetative signs, such as sleep disturbance, appetite disturbance, and irritability appear and pain is often reinforced or perpetuated by social and psychological factors.

Back pain can affect employment, income, family and social roles, producing psychological distress. Resulting somatic amplification can serve the patients' needs for economic survival and maintenance of self esteem.

METHOD

This study was performed in retrospect where all the data was retrieved from the patients' physiotherapy treatment cards from May 1994 to May 1995. Input was obtained from the Occupational Health Department in the form of employment statistics of the various mines which make up Freegold Operations Limited. The Occupational Therapy department supplied information of treatment outcomes ie number of patients successfully resuming work, job changes and repatriations. The obtained information was summarized in table format according to occupation and type of injury and the percentages were calculated.

Results and discussion

Mining Population

Free State Consolidated Gold Mines (Operations) Limited consists of five mines namely Free State Saaiploas, Freddie's, President Brand, President Steyn and Western Holdings as well as the Freegold Health Service (FHS). In total this mining group employs 69 175 people at present and most of these employees receive their medical treatment at the Ernest Oppenheimer Hospital (FHS).

MINE	NUMBER OF EMPLOYEES
Free State Saaiploas	8 320
Freddie's	15 931
President Brand	10 198
President Steyn	14 859
Western Holdings	18 592
Freegold Health Service	1 275
TOTAL	69 175

MINE	UNDERGROUND	SURFACE
Free State Saaiploas	7 524	1 165
Freddie's	14 855	1 857
President Brand	9 541	1 326
President Steyn	13 896	2 635
Western Holdings	16 996	2 661
TOTAL	62 812	9 644

The mine medical officers (1994) calculated that physiotherapy attendances (not only for back pain) accounted for 5% of total lost shifts on the Freegold mines. (Where one physiotherapy attendance = 1 lost shift). Productivity can, therefore, be affected by workers with chronic low back pain.

During the period May 1994 to May 1995, a total of 5 772 patients, of which 267 were patients with back pain, received physiotherapy treatment. Therefore back pain patients account for 4,6% of the total number of patients seen at the Ernest Oppenheimer hospital physiotherapy department in one year. Average attendance of physiotherapy for back patients was 6,7 treatments (1,2 weeks) - while the range varied from one treatment to 47 treatments (8,5 weeks) This wide range of attendances is a cause for concern as it has a significant financial implication for the mining industry. Total time away from work varied from two days - 3,5 months.

DIAGNOSIS	NO OF PATIENTS	PERCENTAGE
Mechanical backache	113	42,3
Chronic low back pain	62	23,2
Contused back	31	11,6
Sprained back	43	16,1
Others:		
Sciatica	3	1,1
Stenosis	3	1,1
Spondylolisthesis	4	1,4
Spondylosis	2	0,7
Scoliosis	2	0,7
Prolapsed disc	4	1,4
TOTAL	267	

Categories of onset of back pain consisted of trauma, spontaneous onset and chronic low back pain. Forty four percent of patients experienced some kind of trauma to their spine while 32% claimed they experienced spontaneous onset of back pain with no previous history of trauma. In the chronic group 24% of patients had backache for longer than three months.

Occupations of patients were noted and divided into two main groups namely: Surface workers (28%) and underground workers (72%). Of the underground workers - drillers and people in the mining team were most at risk, accounting for 19% and 18%

respectively of all patients seen with back pain. In addition, scraper/winch operators (12%), mining helpers (10%), team leaders (8%) and loco operators (8%) were the majority of occupations seen in underground workers.

The rest (25%), included jobs such as engineering helpers, timbermen, grouting assistants and artisans.

Surface workers included occupations such as cleaners, nursing staff, clerks, artisans and shaft assistants.

MECHANISM OF INJURY	NO OF PATIENTS	PERCENTAGE
No history of injury	106	38
Lifted heavy objects	64	24
Mining accident	41	15
Slipped and fell	13	5
Sports injury	7	3
Pathology	8	3
Others e.g. MVA, assault, non-mining accidents	28	10
TOTAL	267	

The majority of the patients seen had no history of injury which could be because of factors such as repetitive strain injury, prolonged effect of vibration on the spine and muscle fatigue.

The second most important cause of injury is lifting heavy objects and 24% of patients gave this as the cause for their back pain. Mining accidents included events such as being struck by rocks, fall from height, breaking rocks and being struck by machines. As surfaces underground are slippery and wet, workers are more susceptible to slipping and falling down. Soccer and rugby as well as running marathons were given as causes for sports injuries resulting in backache.

Patients with pathology of the spine presented with diagnoses of osteoarthritis, spinal stenosis, scoliosis and prolapsed discs. Other mechanisms of injury included motor vehicle accidents, gardening and assaults (non-mining accidents).

Annual statistics taken at the Training Centre by the occupational therapist was that 84% of patients with backache returned to their normal place of work, 15% had to have job changes and 1% of all patients seen with backache had to be repatriated because of the severity of their back pain. Occupational back injury is clearly related to lifting activities. The injury rate is about 3-5 : 1 000 in light industry compared with 200 : 1 000 in heavy industry.⁸ At this stage this is not the case in the Freegold mining industry.

CONCLUSION

Back pain is an important public health problem but there is a paucity of knowledge about causes and underlying mechanisms. Although a lot of research has been done in other industries, very little is known about back pain in the gold mining industry. In order to establish whether there is a problem with chronic back pain, it was necessary to look at all patients treated during the last year at the physiotherapy department of the Ernest Oppenheimer Hospital. The author's recommendation is that further studies should be undertaken to investigate the prevalence of back pain amongst gold mine workers and to compare prevalence of back pain with type of work, age, weight, sitting height, standing height, tribe, abdominal muscle strength, back extensor strength, occurrence of trigger points, range of movement, straight leg raise, number of episodes of back pain, duration of symptoms, time away from work, joint tenderness, family history, psychosocial factors and work environmental factors.

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Current protocol for the treatment of backache at Ernest Oppenheimer Hospital

By the time the patient with low back pain reaches the Physiotherapy Department for treatment, he normally has been on sick leave for seven days, preferably including bed rest for at least two days. The medical officer at the medical station will have assessed the patient, prescribed the appropriate medication or would have referred the patient to the orthopaedic department at the hospital for further management depending upon the severity of the back pain. As some of the back pain will have cleared up after seven days, only patients with persistent back pain are referred to the Physiotherapy Department for treatment. The Physiotherapy Department then follows a protocol:

1. Perform a thorough assessment to establish neurological involvement, soft tissue involvement, range of movement, vertebral joint signs and muscle strength of the abdominal muscles as well as the back extensor. Occupation, duration of symptoms, mechanism of injury and previous episodes of back pain are all noted.
2. Patients are divided into two main groups namely those with mechanical backache and backache with neurological involvement.
3. Muscle spasm is treated with acupuncture, ultrasound, hot packs and interferential therapy as appropriate (normally for 2-3 days)
4. Maitland mobilisation of the lumbar spine once muscle spasm is relieved in order to relieve pain and increase range of movement in the lumbar spine (normally for 3-5 days).
5. Patients with mechanical backache progress into the back rehabilitation exercise class consisting of McKenzie extension exercises, strengthening exercises for the abdominal muscles and back extensor, as well as stretching exercises of paravertebral muscles.
6. Patients are normally discharged after two weeks of physiotherapy (ten treatments) to the Training Centre (an area set up to simulate actual working conditions underground and run by an occupational therapist with vocational training being the main aim.)
7. Patients with neurological involvement receive Maitland mobilisations as well as traction (13-20 kg) or stretching of neurological tissue daily but do not participate in the back rehabilitation class until neurological signs decrease.

8. If, after two weeks (ten treatments), there is no improvement in the patient with neurological signs, the physiotherapist will refer the patient back to the orthopaedic department. If, after reassessment, the patient is referred back to physiotherapy again, we will continue treatment for a further two weeks (ten treatments) or until neurological signs decrease.
9. If there are no further positive results with physiotherapy, the patient is referred back to the orthopaedic surgeons.
10. All patients with backache are taught a home exercise programme which they should do 2-3 times a day.
11. Chronic backache patients (mechanical) normally have very weak abdominal and back extensor muscles and therefore need strengthening exercises rather than electrotherapy. Electrotherapy is applied where indicated for pain and muscle

spasm.⁷

12. Kinetic handling as well as final strengthening exercises are done by means of lectures and demonstrations at the Training Centre. Patients are retrained to do their original jobs from a kinetic handling point of view. It is very important that all patients go through the Training Centre. Computerised records are kept on each patient so that we can identify patients with numerous backache episodes. The programme at the Training Centre is normally completed in two weeks. (Total time away from work = 1 week sick leave, 2 weeks at physiotherapy, 2 weeks at Training Centre = 5 weeks if there are no complications and patient responds well to treatment.)
13. Patients are sent back to their normal place of work or the job may be changed depending on the outcome of the programme.