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Construction worker injuries and costs – a comparative study of older and younger workers

An exposure assessment of a laboratory assistant to hazardous chemical substances

Detection of environmental *Mycobacterium tuberculosis* using rapid and sensitive conventional and real time polymerase chain reaction

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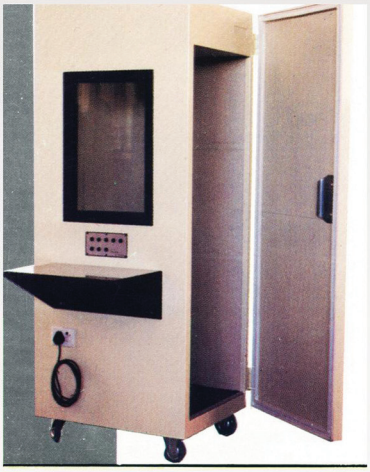

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From the Editor . . .

Linda Grainger, Editor

At our June 2009 meeting, the Editorial Board suggested that it would be useful to publish information on occupational injury and disease trends. Rand Mutual Assurance Company Limited is licensed to administer and deliver compensation benefits in accordance with the Compensation for Occupational Injuries and Diseases Act of 1993 to members in the mining industry, and provides cover for over 400 000 employees in this sector. Therefore, Deodat Kritzinger, the General Manager Medical Services RMA, was approached and kindly provided recent information on the claims and costs processed by RMA. Deodat, who is also the current Vice-President of the Mining Medical Professional Association, is well qualified in this field as he holds the DoH, an MBA, a certificate in COID and is a Certified Independent Medical Examiner. He has worked as an occupational medical practitioner in the mining sector and joined RMA in 2002. We are most grateful to him for the article that he has written.

The construction industry is responsible for the most fatalities worldwide, and the accident and injury rates are higher in this industry compared with most others. Our construction workforce is ageing, and international research has shown that serious occupational injuries involving death or disability increase with age and that injury recovery times tend to be longer for older workers, all of which can increase injury costs. In an effort to quantify injury costs among older workers in order to convince employers that poor safety and health impacts negatively on their bottom-line, Eppenberger and Haupt describe their study in which they quantified the injury rates among older construction workers, investigated the injuries by trade, event, type, and bodily location and calculated the associated costs to determine whether there were any differences between injuries to older and younger workers. They used data sourced from Federated Employer's Mutual Assurance Company, the only private workman's compensation insurer registered by the Department of Labour to cater for construction injuries.

Franken, Eloff, Laubscher, Van Aarde and Du Plessis, all SAIOH members, have contributed a case study to this issue. The purpose was to describe a survey that was conducted to quantify the exposure of a university laboratory assistant to multiple hazardous chemical substances, in order to determine whether this exposure exceeded safety limits and recommend preventative measures if indicated. The value of the study lies in its description of the assessment of the calculated additive effect of his exposure. It also emphasises the need for TWA-8h exposure sampling together with short-term exposures sampling to clarify the extent and duration of peak exposures when planning and assessing workers' exposures.

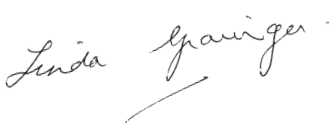
South Africa has the 7th highest TB incidence in the world, causing concern for the safety of healthcare workers who are responsible for providing health services for infected patients. A significant advance towards controlling *Mycobacterium tuberculosis* (MTB) exposure in occupational settings in South Africa would be provided by the identification of noninvasive methods which are rapid and sensitive enough to detect and quantify airborne MTB. The polymerase chain reaction method has been used, but evidence has been lacking to support the use of different filter types. Mabe, Singh, Kirsten, Bello and Dayal report the results of their study to detect and quantify MTB from various sampling media using rapid and sensitive conventional and real time PCR.

Although numerous studies have been conducted on musculoskeletal disorders amongst office workers in other countries, there is a dearth of such studies in the South African context, and particularly in the private health care sector. Zungu and Ndaba investigated the prevalence in such a group as well as the association between the physical demands of their work and musculoskeletal disorders. The study literature and findings should be useful for practitioners who need to advise on the prevention of these problems, especially in relation to computer work.

During October and the beginning of November, there are no less than seven OH&S events in South Africa. These include SASOM and SAOHN's annual conferences. Please check the calendar page for further details, and try to attend at least one of them as they are sure to be worthwhile.

Some important information is the new website address for SAIOH (www.saioh.co.za) and SASOM (www.sasom.org). SASOM also has a new email address: info@sasom.org.

Finally, I recently attended a very moving event in Cape Town. It was the launch of the Moments in Time calendar for 2010. This is a corporate responsibility project sponsored by AstraZeneca, and it takes the form of a documentary featuring 13 cancer ambassadors. It hopes to reveal the meaning of life through their stories of courage, faith and fearlessness. So many of us have been touched by cancer and I think that their stories will be of significance to us, our families and our friends. Please have a look at their website and support this project (www.momentsintime.co.za). The proceeds from the sale of the calendars and other merchandise are used to help people with cancer, and who do not have medical aid.



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In June 2009, the Discovery Foundation awarded 22 fellowships, grants and awards of almost R14 million to individuals and institutions to further train medical specialists. These recipients included the University of the Free State's Department of Ophthalmology and the Department of Medicine at Groote Schuur Hospital, as well as medical registrars from the Universities of Cape Town, the Witwatersrand, Limpopo, Pretoria, the Free State and Stellenbosch.

Applications for the 2010 Discovery Foundation Rural Fellowship and Sub-specialist Awards are now open until 30 October 2009. More information about the key principles, application process and selection criteria is available at www.discovery.co.za/foundation.

Discovery Foundation

Rand Mutual Assurance – The workmen's compensation carrier for the mining industry

Deodat Kritzinger, (MBChB, MPraxMed, DOH, MBA), RMA – General Manager Medical Services, Rand Mutual Assurance Co. Ltd.
E-mail: dkritzinger@randmutual.co.za

The Rand Mutual Assurance Company Limited (RMA) recently celebrated its 115th birthday. RMA was established on 1st June 1894, with a share capital of 3380 pounds and comprising three members: Simmer and Jack Mines, Jumpers Gold Mine and Geldenhuis Estates. At the peak of the mining industry, RMA insured the lives of some 800 000 employees and today it insures in excess of 400 000 lives of 304 members with the focus on caring, compassionate, compensation.

RMA is a mutual association licensed to administer and deliver compensation benefits in accordance with the Compensation for Occupational Injuries and Diseases Act of 1993 (COIDA)[1] to members in the mining industry. Benefits include:

- payment of reasonable medical cost;
- total temporary disablement (TTD) or loss of earnings;
- permanent disability (PD);
- emergency transport;
- monthly pension to dependants in case of fatal injury; and
- funeral expenses.

With its Head office in Johannesburg, services are rendered through its six branches namely Johannesburg, Klerksdorp, Rustenburg, Welkom, Witbank, and Carletonville. Claims processing is performed at all the branches, with additional services, mainly to pensioners, provided through three offices in Mthatha, Maseru and Xai-Xai.

The claims cycle consists mainly of four elements:

- Reporting of a claim with submission of supportive documents by employer.
- Medical treatment of the injured or diseased employee by medical service providers supported through medical reports. Payment of TTD's days off work in excess of three consecutive days.
- Award of compensation for functional loss in accordance with the instructions of COIDA and based on the final medical report of the treating practitioner. Compensation award is in the form of a lump sum payment (<30%) or monthly pension (>30%) depending on functional loss expressed as percentage of permanent disability.
- Assistance with ongoing reasonable medical treatment of injury or disease-related conditions.

It should be noted that not all medical treatment costs are covered by RMA because of Section 78 arrangements with employers. This specific section of COIDA makes provision for and allows employers to render medical services for the first two years after an injury, to affected employees.

Specific challenges are encountered with all elements of the claims cycle. Reporting of claims is the most important but also the most neglected aspect. Delay or non-reporting of claims will affect all other aspects of the claim cycle and RMA is constantly involved in assisting members with timeous reporting of claims.

Reported claims are ICD 10 coded according to

Table 1. Total number of reported claims for 2008

DRG	Description	Number of claims	% of total claims
DRG00	Fatal	142	0.56%
DRG01	Spinal cord injuries	14	0.06%
DRG02	Lower limb amputees	18	0.07%
DRG03	Upper limb amputees	6	0.02%
DRG04	Partial or total blindness	228	0.90%
DRG05	Noise-induced hearing loss (NIHL) and acoustic trauma	1790	7.05%
DRG06	Injuries to the head	2500	9.84%
DRG07	Injuries to the neck	199	0.78%
DRG08	Injuries to the thorax	757	2.98%
DRG09	Back injuries	1217	4.79%
DRG10	Injuries to the abdomen and pelvis	38	0.15%
DRG11	Injuries to the shoulder and upper arm	1310	5.16%
DRG12	Injuries to the elbow and forearm	1477	5.82%
DRG13	Injuries to the wrist and hand	5095	20.06%
DRG14	Injuries to the hip and thigh	610	2.40%
DRG15	Injuries to the knee and lower leg	2537	9.99%
DRG16	Injuries to the ankle and foot	2768	10.90%
DRG17	Injuries involving multiple body regions	290	1.14%
DRG18	Foreign body in eye, ear and lung	1587	6.25%
DRG19	Burns and corrosion	343	1.35%
DRG20	Toxic effects – solvents, metals, chemicals, gases	239	0.94%
DRG21	Effects of radiation, heat, pressure, electricity, vibration	128	0.50%
DRG22	Mental and behavioural disorders	62	0.24%
DRG23	Diseases of the respiratory system	599	2.36%
DRG24	Skin disease (dermatitis / eczema)	11	0.04%
DRG25	Other conditions – miscellaneous	180	0.71%
(blank)	(blank)	1249	4.92%
Grand total		25 394	100.00%

Table 2. Total cost of acute care in reported cases for 2008

Benefit	Data	
	Cost (Rands)	Cost %
Days off	30 081 357.78	8.95%
Fatal	78 834 886.84	23.45%
Medical	75 840 189.29	22.56%
Not classified	338 942.23	0.10%
PD	152 267 494.92	45.29%
Recoveries	-1 244 207.08	-0.37%
Sundry	92 204.44	0.03%
Grand total	**336 210 868.42**	**100.00%**

Table 3. Total cost of pensioner care for 2008

Benefit	Data	
	Cost (Rands)	Cost %
Days off	19 845.61	0.03%
Fatal	5 661 907.79	8.58%
Medical	51 108 842.64	77.44%
Not classified	3 011 046.20	4.56%
PD	12 007 990.60	18.20%
Recoveries	-6 013 601.77	-9.11%
Sundry	199 564.19	0.30%
Grand total	**65 995 595.26**	**100.00%**

Table 4. Total cost of subsequent non-pensioner care for 2008

Benefit	Data	
	Cost (Rands)	Cost %
Days off	949 620.64	7.43%
Fatal	2 253 239.27	17.62%
Medical	6 577 273.71	51.45%
Not classified	48 959.15	0.38%
PD	4 200 280.40	32.85%
Recoveries	-1 726 442.91	-13.50%
Sundry	481 476.22	3.77%
Grand total	**12 784 406.48**	**100.00%**

information provided on claims forms and medical reports. These ICD 10 codes are grouped into diagnostic related groups (DRG) for reporting and statistical purposes (see Table 1).

The lack of submission of detailed medical reports to reflect the severity of affected parts and inclusion of specific detail with the functional assessment and completion of the final medical report, is also an area of concern. Specific reports were designed to assist medical service providers to report on the critical elements needed for the estimation of functional loss and conversion to permanent disability. (These reports are available on the RMA website – www.randmutual.co.za.)

An analysis of the expenditure in the acute phase of injuries and diseases is shown in Table 2. It indicates that the single and most prominent element is payment of PD awards. This is directly related to the quality and correctness of final medical reports, hence the drive to further improve this important aspect. (The total medical cost is masked because of Section 78 agreements where employers are responsible for the first 2 years of medical costs incurred). Recoveries represent expenses recovered from 3rd parties such as road accidents.

Ongoing medical needs of RMA beneficiaries, more specifically pensioners, are managed with the assistance of medical case auditors in RMA branches and offices, supported by medical doctors. The design of an in-house Pensioner Medical Plan (PMP) aims to complement the management of identified pensioners. It is a pro-active approach for the early intervention of known medical risks to pensioners' health, with the objective of promoting and preserving healthy living and an optimum quality of life.

The PMP Programme currently focuses on the high risk, high cost pensioner to effectively manage related medical costs and includes the pro-active review of DRG 1, 2, 3 pensioners. Specific interventions for the DRG 1 group include home visits and urological reviews. During 2008, a total of 428 home visits and 537 urological reviews were performed. Interventions for the DRG 2 and 3 groups consist of bi-annual visits to review prosthetic requirements and ensure functionality of prosthetic devices. During 2008, a total of 619 lower limb and 91 upper limb prosthetic reviews were performed.

An analysis of the costs of pensioner care is presented in Table 3. Medical benefits were the most prominent feature of this expenditure, with a total amount of R 51.1 million. Of this amount, R35.9 million was paid for the medical treatment and follow up of DRG 1 pensioners.

In addition to the RMA pensioners' medical needs, the ongoing medical need of non-RMA pensioners with accident-related medical conditions is also given attention. These cases are re-opened upon requests from treating doctors, motivated with supporting evidence of a relationship with the accident. Adjudication may be particularly difficult when documentation and the quality of reports at the time of initial examination are poor. As part of the licence condition and provisional settlement powers, these cases will in future be referred to the office of the Compensation Commissioner for confirmation of liability. A summary of these costs are reflected in Table 4.

RMA staff commit themselves to service excellence to all role players involved in administration and management of work-related injuries and diseases with "Caring, Compassionate, Compensation".

The contact details of the head office and branches appear on the RMA website. Medically-related issues can be forwarded or discussed with regional medical managers: Dr Peggy Sekele and Dr Busi Mashaba or myself, Dr Deodat Kritzinger.

Reference

1. Department of Labour, South Africa. Compensation for Occupational Injuries and Diseases Act, No. 130 of 1993, as amended by the Compensation for Occupational Injuries and Diseases Amendment Act No. 61 of 1997. Accessed on 10 November 2008 at http://www.labour.gov.za/legislation/acts/compensation-for-occupational-injuries-and-diseases/compensation-for-occupational-injuries-and-diseases-act.

PEER REVIEWED

Construction worker injuries and costs – a comparative study of older and younger workers

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Abstract

Background: The construction workforce in South Africa is ageing, which necessitates research into how the older cohort can be optimally engaged.

Objective: Quantify the injury rates among older construction workers, investigate the injuries by trade, event, type, and bodily location and calculate the associated costs to understand whether there are any discernable differences between injuries to older and younger workers. Older workers were those over the age of forty years engaging in on-site construction work activities.

Method: A literature review and analysis of data for the Western Cape region for 2002 from a comprehensive injury claims database was conducted.

Results: Older workers sustained less injuries in total compared with younger workers. There were no discernable variances occurred in relation trade, events leading to injuries and the type/nature of injuries. However, for the body parts affected, older workers were more prone to certain specific injuries. The costs of older worker injuries were substantially higher on average.

Key words: construction, older worker, injury, cost

Introduction

Globally, the construction workforce is ageing[1,2] and this will impact on South Africa.[3] It is attributed to changes in demographics and a loss of interest among young people in a career in construction, leading to an increase in the proportion of older construction workers.[2] Therefore, older construction workers are a valuable source of experience and skills, but they are exposed to a wide range of hazards leading to injuries that cost the industry millions of rands every year. To utilise older construction workers optimally, it is important to protect and improve their personal well-being. For a workforce to be productive it must be healthy.[4] This is supported by the Occupational Health and Safety Act (1993) that requires all employers to create a healthy and safe working environment.[5]

The accident and injury rates in construction are higher than in most other industries.[6,7,1] Furthermore, the construction industry is responsible for the most fatalities worldwide.[8-11] Figure 1 depicts the high rates of work-related fatalities in the USA in 2002 (all age groups). Apart from the serious consequences of such injuries and deaths for individuals, families and communities, substantial unnecessary costs to the industry are incurred. For example, in the USA in 2002 7.1 non-fatal injuries occurred for every 100 construction workers, with 2.8 of these resulting in days off work.[6] Disability due to construction accidents was found to be higher for older workers and directly related to age and period of employment.[12]

Research suggests that serious occupational injuries involving death or disability increase with age while less serious injuries decrease.[13-15] In addition, the older worker generally takes longer to recover from injury, resulting in the cost per injury increasing. This may be attributed to the pre-existing physical condition of the older worker and/or the injury being more serious in nature.[13,15] Older workers may also experience certain specific injuries. McCann and Chowdhury[16] found that falls from ladders composed 60% of all fall-related injuries that occurred to workers aged 44 years. This research finding suggests that balance and body weight may have been causative factors leading to the high percentage of falls from ladders among this age

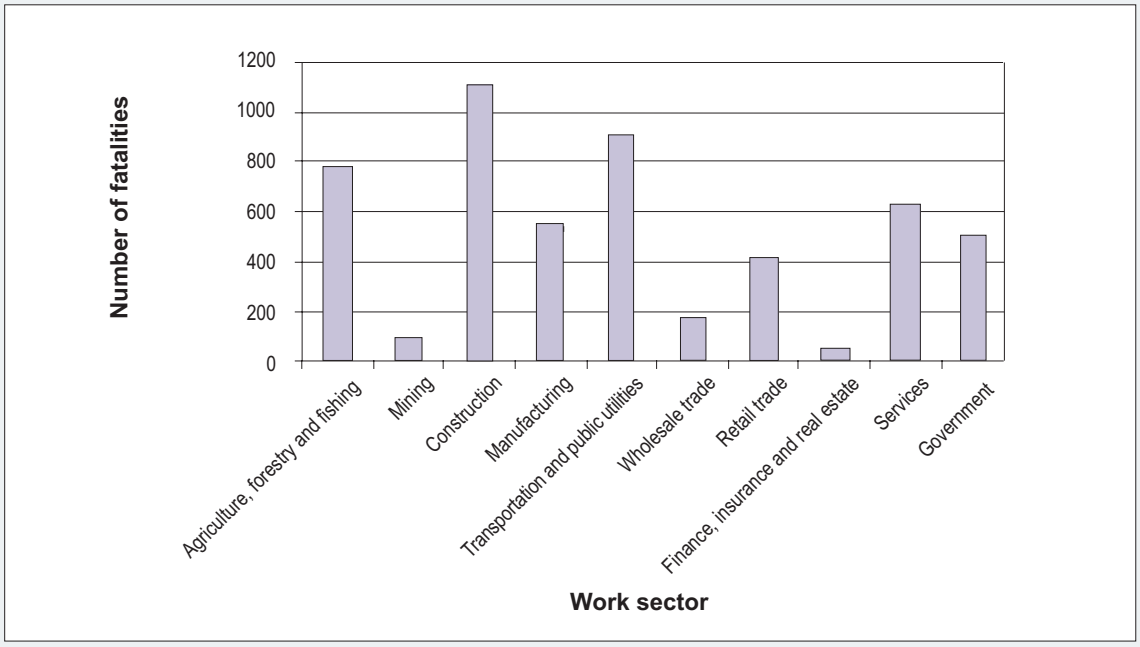

Figure 1. Distribution of worker deaths in the USA in 2002 (Adapted from Hinze, 2006:6[6])

"The accident and injury rates in construction are higher than in most other industries."

group. Other factors that may lead to a higher risk of injury are poor eyesight and poor hearing.[15]

Furthermore, the costs of claims by South African construction workers according to the industry's registered insurance provider, FEMA, have been increasing overall since 2003. They were reported as being R9 699 before 2005; R11 310 in 2005; R12 315 in 2006; R10 959 in 2007; and R11 035 in 2008.[17] Minimising the cost of construction injuries should therefore be high on an organisation's list of priorities.

With the above in mind, it became important to quantify injury costs among older workers in order to convince employers that poor safety and health impacts negatively on their bottom-line and that improved worker protection plans may be the answer to improving profitability.[6,7] However, no South African studies on older construction workers, except for those by Deacon, Smallwood and Haupt[18,19] and Haupt, Deacon and Smallwood[20-23] have been published. Therefore, a study was conducted in 2008 with the following research objectives:

- to establish the nature of the relationship between injuries to older and younger workers and their consequent direct costs; and
- to establish in both age cohorts the relationships between costs of injuries, age, and criteria such as: work trade; event leading to injury; type of injury; and body part affected.

The hypothesis was that the cost of injuries was higher

among older workers compared with younger workers. Based on a literature review and survey of South African contractors, older workers were defined as those over the age of forty years engaging in on-site construction work activities such as general work, bricklaying, carpentry, plastering, and painting.

The potential benefits of the study to industry are a consolidation of injury information relating to older construction workers. This should assist construction managers with developing policies and implementing strategies to prevent or at least minimise injuries and the related costs, with the aim of more effectively utilising their older workers and ultimately achieving a more sustainable construction industry.

Methodology

The study consisted of a literature review and an analysis of secondary data sourced from the only private workman's compensation insurer registered by the Department of Labour to cater for construction injuries (Federated Employer's Mutual Assurance Company). The database represented 1 492 injury claims collected during the period 2002. This was the only comprehensive disaggregated database that was available for analysis. More recent data exists, but these are aggregated and were not useful for this study. For example, Table 1 shows aggregated data obtained from FEMA for the periods 2006 and 2007. Additionally, the organisation was only willing to make the 2002 records available for the study.

It must be remembered that only direct costs were gathered, namely those costs covered by workman's compensation, and were therefore easy to quantify i.e. percentage of wages paid to workers while off work; ambulance; hospitalisation; general medical expenses; and disability pay out. Older workers may not necessarily be at higher risk of injury, however when they do get injured, they generally take longer to recover meaning that they tend to remain off work for longer and have more visits to doctors, occupational therapists and physiotherapists.[25] Time off work and doctors bills are examples of direct injury costs and seem to be higher among older workers in relation to younger workers.[15,26]

Due to the nature of the study, ethical approval for the

Table 1. Health and safety accidents by cause: FEMA[24]

	2006		2007	
Accident type	Number of claims	Number of fatalities	Number of claims	Number of fatalities
Accident type N.E.C	43	1	95	3
Striking against	788	1	975	0
Struck by	4 031	17	4 474	10
Caught in, on, between	872	4	877	4
Fall onto same level	200	0	516	1
Fall onto different levels	1 254	18	1 406	10
Slip or over-exertion	1 131	1	683	0
Contact with temperature extremes	89	1	92	0
Inhalation, absorption, ingestion	80	3	199	4
Contact with electrical current	14	1	36	0
Unclassified / Not sufficient data	31	0	21	0
Motor vehicle accident	651	27	857	28
Total	**9 184**	**74**	**10 231**	**60**

Table 2. Cost of injuries (FEMA sample 2002)

	Younger workers		Older workers	
Cost category (Rands)	Frequency	Percent	Frequency	Percent
0	0	0	0	0
1–199	48	4.7	11	2.4
200–499	290	28.3	109	23.3
500–999	331	32.3	125	26.8
1 000–1 999	156	15.2	105	22.5
2 000–2 999	45	4.4	30	6.4
3 000–3 999	30	2.9	10	2.1
4 000–4 999	18	1.8	6	1.3
5 000–5 999	14	1.4	8	1.7
6 000–6 999	9	0.9	6	1.3
7 000–7 999	4	0.4	0	0
8 000–8 999	5	0.5	8	1.7
9 000–9 999	6	0.6	3	0.6
10 000–19 999	34	3.3	18	3.9
20 000–49 999	22	2.2	16	3.4
50 000–99 999	9	0.9	9	1.9
>100 000	4	0.4	4	0.9
Total	**1 025**	**100.0**	**467**	**100.0**

". . . serious occupational injuries involving death or disability increase with age . . ."

Table 3. Cost of injuries in relation to trade/occupation (FEMA sample 2002)

Trade	Younger <40			Older >40		
	Injuries (%)	Cost (Rands)	Ave cost (Rands)	Injuries (%)	Cost (Rands)	Ave cost (Rands)
Labourer	832 (81.2)	2 174 131	2 613	256 (54.8)	1 167 695	4 561
Carpenter	57 (6.9)	425 051	7 457	78 (16.7)	433 375	5 556
Roofer	12 (1.1)	11 099	924	17 (3.6)	31 816	1 871
Electrician	42 (4.1)	300 145	7 146	22 (4.7)	87 509	3 977
Rigger	1 (0.1)	454	454	7 (1.5)	5 771	824
Tiler	3 (0.3)	1 831	610	3 (0.6)	1 704	568
Glazier	10 (1.1)	62 763	6 276	6 (1.3)	1 960	326
Painter	24 (2.3)	290 016	12 084	25 (5.4)	288 685	11 547
Bricklayer	14 (1.4)	19 254	1 375	30 (6.4)	204 528	6 817
Mason	1 (0.1)	1 117	1 117	8 (1.7)	52 096	6 512
Plasterer	1 (0.1)	273	273	2 (0.4)	3 693	1 846
Plumber	26 (2.5)	35 666	1 371	13 (2.8)	294 109	22 623
Other	2 (0.2)	2 141	1 070	0	0	0
Total	**1 025 (100)**	**3 323 941**	**3 242**	**467(100)**	**2 572 941**	**5 509**

study was not necessary given that no particular party would be harmed by the disclosure of the findings of the study. No data would be traceable to a particular person or party.

Results and discussion

For the 1 492 injuries representing the 'compensation insurer' sample, younger worker injuries represented 68.7% (1 025 cases) of the total sample while the older workers represented 31.3% (467 cases). Mean costs for injuries are given in Rands only, cents have been omitted. The mean cost per injury for younger workers was R3 243 and ranged from a minimum of R105 to a maximum of R179 932. The mean cost per injury for the older workers was R5 500, and ranged from a minimum of R170 to a maximum of R167 262. The median was R697 for the younger group and R928 for the older workers. The mean cost difference between younger and older workers was R2 266 per claim. Older construction worker injuries were 41% higher on average compared with younger construction worker injuries. Therefore, the hypothesis that the cost of injuries was higher among older workers compared with younger workers was accepted. This finding supports the literature where older work injury costs are said to be higher due to recovery rates being slower and workers being off work for longer periods compared with their younger counterparts.[25,26]

From Table 2 it is evident that most injuries to younger as well as older workers cost between R500 and R999 (32.3% and 26.8% respectively). Further, 65.3% of younger and 52.5% of older worker injuries cost less than R999, possibly confirming the findings of previous studies.[25,26]

Table 3 shows the injuries costs[13] of the trade categories that have been standardised by FEMA.

The labourer category (also termed general workers) was the most injured cohort in both groups, not surprisingly considering that they represent a large proportion of construction personnel. The next most represented trade,

once again in both cohorts was carpenter, with this trade comprising 16.7% of the older group.

The trades representing the highest average injury costs for older workers were plumbers (R22 623), painters (R11 547) and bricklayers (R6 817). Painters represented the trade with the highest average injury cost for younger workers (R12 084). Painters generally work in elevated work positions and falls from heights (fall on different level) could be the reason for these high injury costs in both cohorts. It is important to be aware that the South African reality is that the wage differential between older workers and their experience relative to younger and comparatively less experienced workers is not significant.

The events or causes of injuries leading to injuries (using the standard FEMA reporting categories) are presented in Table 4. The events leading to the most injuries for older workers were 'Struck by' (42.2%), 'Fall on different level' (17.1%) and 'Strike against' (13.3%), while the events leading to the most injuries for younger workers were 'Struck by' (49.9%), 'Strike against' (14.8%) and 'Fall on different level' (11.2%).

'Struck by' injuries include objects and materials falling onto workers from elevated positions. 'Striking against' injuries include such instances where a worker knocks his

head, hand or knee against an object or structure. 'Fall on different level' is an event where a worker falls from one level or floor to another, usually in excess of 2,5 m in height. This must not be confused with 'Fall on the same level' where a worker trips and falls onto the same level or floor on which he is working or walking. The event category, 'Slip or overexertion' leads to such injuries as strains and sprains resulting in knee and back injures as well as ankle related injuries. The findings of McCann and Chowdhury[16] are supported since a larger proportion of older workers experienced falls on different levels than younger workers.

Table 4. Cost of injuries in relation to events leading to injuries (FEMA sample 2002)

	Younger <40			Older >40		
Event / cause	**Injuries (%)**	**Cost (Rands)**	**Ave cost (Rands)**	**Injuries (%)**	**Cost (Rands)**	**Ave cost (Rands)**
Accident type N.E.C	4 (0.4)	2 310	577	1 (0.2)	459	459
Striking against	152 (14.8)	295 358	1 943	62 (13.3)	186 333	3 005
Struck by	511 (49.9)	1 063 723	2 085	197 (42.2)	993 706	5 044
Caught in/on/between	69 (6.7)	393 606	5 704	29 (6.2)	122 866	4 236
Fall on the same level	33 (3.2)	114 616	3 473	20 (4.3)	30 923	1 546
Fall on different level	115 (11.2)	1 128 672	9 814	80 (17.1)	1 018 306	12 728
Slip or overexertion	91 (8.9)	170 756	1 876	59 (12.6)	132 494	2 245
Contact with temperature	15 (1.5)	69 516	4 634	7 (1.5)	5 172	738
Contact with electricity	7 (0.7)	27 732	3 961	1 (0.2)	5 080	5 080
Motor vehicle accident	16 (1.6)	49 831	3 114	8 (1.7)	57 312	7 164
Other	12 (1.2)	8 583	715	3 (0.6)	13 395	4 465
Total	**1 025 (100)**	**3 324 703**	**3 243**	**467 (100)**	**2 566 046**	**5 494**

Table 5. Cost of injuries in relation to nature or type of injuries (FEMA sample 2002)

	Younger <40			Older >40		
Nature / type	**Injuries (%)**	**Cost (Rands)**	**Ave cost (Rands)**	**Injuries (%)**	**Cost (Rands)**	**Ave cost (Rands)**
Penetrating wounds	316 (30.8)	354 757	1,122	131 (28.1)	383 922	2 930
Superficial wounds	385 (37.6)	632 081	1,641	154 (33.1)	382 520	2 483
Multiple injuries	49 (4.8)	737 275	15,046	32 (6.9)	337 047	10 532
Internal organs	5 (0.5)	19 521	3,904	0	0	0
Muscle injury	107 (10.4)	210 126	1,963	72 (15.4)	131 132	1 821
Joint injury	60 (5.9)	235 691	3 928	31 (6.6)	382 913	12 352
Bony injury	77 (7.5)	861 467	11 187	34 (7.3)	826 938	24 321
Amputation or removal of organ	10 (1.1)	259,898	25 989	6 (1.3)	93 985	15 664
Other	16 (1.6)	14,451	903	7 (1.5)	26 799	3 828
Total	**1 025 (100)**	**3 325 267**	**3 244**	**467 (100)**	**2 565 576**	**5 493**

Table 6. Cost of injuries in relation to bodily location of injuries (FEMA sample 2002)

Body part	Younger <40			Older >40		
	Injuries (%)	Cost (Rands)	Ave cost (Rands)	Injuries (%)	Cost (Rands)	Ave cost (Rands)
Head	66 (6.4)	231 011	3 500	20 (4.3)	226 295	11 314
Neck	9 (0.9)	5 817	646	8 (1.7)	6 728	841
Trunk	133 (13.0)	443 855	3 337	80 (17.1)	334 811	4 185
Shoulder	30 (2.9)	126 591	4 219	15 (3.2)	64 925	4 328
Arm	52 (5.1)	251 155	4 829	14 (3.0)	76 629	5 473
Hand	59 (5.8)	261 316	4 429	40 (8.6)	80 932	2 023
Finger	217 (21.2)	509 961	2 350	83 (17.8)	405 936	4 890
Wrist	24 (2.3)	60 426	2 517	7 (1.5)	50 507	7 215
Leg	70 (6.8)	401 886	5 741	36 (7.7)	266 062	7 390
Foot	86 (8.4)	117 807	1 369	36 (7.7)	140 589	3 905
Knee	30 (2.9)	100 393	3 346	31 (6.6)	276 046	8 904
Ankle	39 (3.8)	43 005	1 102	9 (1.9)	121 940	13 548
Eye	142 (13.9)	113 128	796	44 (9.4)	117 265	2 665
Multiple	64 (6.2)	656 051	10 250	42 (9.0)	388 185	9 242
Unspecified	4 (0.4)	2 296	574	2 (0.4)	9 196	4 598
Total	**1 025 (100)**	**3 324 698**	**3 246**	**467 (100)**	**2 566 046**	**5 448**

"The mean cost difference between younger and older workers was R2 266 per claim."

The event representing the highest average cost was the same for both groups, namely 'Fall on different level' costing R9 814 for younger workers and R12 728 for older workers.

Table 5 sets out the nine categories used when reporting the nature/type of injuries to FEMA.

The most common nature of injuries in older workers were superficial wounds (33.1%), penetrating wounds (28.1%) and muscle injury (15.4%), while the most common nature of injuries in younger workers were superficial wounds (37.6%), penetrating wounds (30.8%) and muscle injury (10.4%).

The category 'Bony injury' represented the highest average cost for older workers (R24 321) while for younger workers the the highest average cost was 'Amputation or removal of organ' representing R25 989 on average. The average cost of bony injuries was also high for younger workers, however less than half the average cost when compared with older workers. This is significant given that the finding accords with the literature and substantiates the medical claim that older workers take longer to heal.[6] Fractures and other bone-related injuries are termed serious and necessitate lengthy periods of recovery. Amputations represented the highest average cost of injuries for younger workers and the second highest average cost for older workers which may be due to the high medical costs and resulting lengthy recovery time associated with

these injuries. 'Amputations' was however the least frequent type of injury to older workers.

Table 6 sets out the 15 categories representing the bodily location of injuries (body parts injured). The most likely body parts of older workers to be injured on construction sites were finger (17.8%), trunk (17.1%) and eye (9.4%), while the most likely body parts of younger workers to be injured on construction sites were finger (21.1%), eye (13.9%) and trunk (13.0%).

The injuries representing the highest cost on average for older workers were ankle injuries (R13 548) followed by head injuries (R11 314) and multiple injuries (R9 242). For younger workers the representation was somewhat dissimilar. Multiple injuries (R10 250) represented the highest average cost, followed by leg injuries (R5 741) and arm injuries (R4 829).

Conclusions

The findings indicated that older construction worker injuries were responsible for substantially higher direct costs compared with younger construction worker injuries. The injury costs discussed in this study are limited to direct insured costs and purposefully excluded the hidden, indirect costs which are not easily quantifiable. According to Hinze[6] and Grossman[27] indirect injury costs range anywhere between 0.23 and 20 times the direct costs. It can therefore be deduced that older worker injury claims presented in this research when inclusive of the hidden costs could escalate to somewhere in the region of R55 000 on average per claim, using a factor of 10 for the hidden costs.

Recommendations

The study proposed a combination of interventions.[28] Training can have the most immediate impact, being reduction of older worker injuries. It should combine safety and health-related training and skills-based job task training. Ongoing re-enforcement and up-skilling maintains a high level of worker production, quality and safety, whilst also reducing injury risk. Medical surveillance can ascertain physical and mental fitness for the job, which is important in preventing the exacerbation of health problems, negatively impacting on productivity levels, and increasing the risk of injury to the worker as well as to co-workers. The introduction of older worker forums where their problems and related solutions can be discussed and debated could assist with the reduction of injuries. Construction companies also need to start utilising detailed, effective injury investigation strategies as well as the calculation of injury costs to understand older worker injuries within their organisation. Finally, construction site managers and foremen should be made aware of hazardous tasks and activities which have a higher risk of leading to older worker injuries. An example found in this study is that older workers are prone to higher rates of back-related injuries as well as knee injuries. The associated costs of these injuries are high and these high costs should be incentive enough to reduce them.

Lessons learned

1. **It is incorrect to assume that older workers are more likely to be injured than younger workers.**
2. **While the costs per injury may be higher for older workers the number of injuries might, in fact, be less.**
3. **Strategies need to be considered to expand the working lifespan of older workers and retain their experience and skills especially in times when the shortage of skills is critical.**

"... a larger proportion of older workers experienced falls on different levels than younger workers ..."

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Drugs of abuse

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Part 4

The fourth article in the series on drugs of abuse (DAU) continues the descriptions of frequently used drugs, indicating their common names, ingredients, effects and appearance.

Methadone[1,2,3,4,5]

Streetnames

Fizzies, Dollies

Methadone is an opioid with a similar structure to propoxyphene. The pharmacological actions of methadone are similar to those of other opioids and include analgesia, sedation, respiratory depression, miosis, anti-tussive effects and constipation. When administered intravenously, methadone and morphine have equivalent analgesic potency.

Methadone is rapidly absorbed from the gastro-intestinal (GI) tract with an onset of action within 30–60 minutes. The elimination half-life is long (15–55 hours) compared to morphine (half-life 1–8 hours). Because of the longer elimination half-life, methadone accumulates in blood and tissues following repeated doses, and this presumably contributes to its relatively long duration of action (6–8 hours).

Methadone is used clinically for relief of pain, to treat opioid abstinence syndrome and to treat heroin addicts in an attempt to wean them from illicit intravenous drug use. Tolerance to the effects of methadone develops with repeated doses, but more slowly than is true for morphine.

Likewise, withdrawal develops more slowly and is generally less intense but more prolonged than morphine withdrawal. Withdrawal symptoms include weakness, anxiety, insomnia, abdominal discomfort, sweating and hot-and-cold flushes.

In overdose, methadone causes central nervous system (CNS) and respiratory depression, miosis, bradycardia, hypotension, circulatory collapse, hypothermia, coma, seizures and pulmonary oedema (although less frequently than morphine).

Treatment for methadone overdose includes supportive measures to maintain adequate respiration and blood pressure and the administration of the opioid antagonist, naloxone (Narcan), to reverse the effects of methadone.

Due to the prolonged elimination half-life, repeated administration of naloxone may be required, and patients should be monitored for 48–72 hours following overdose.

The initial screening test for methadone is most often immunoassay. For confirmation of a presumptive positive, a quantitative drug measurement is performed using GC/MS. A typical assay cutt-off concentration for immunoassay is 300 ng/mL. Methadone may be detected in urine for up to 72 hours following ingestion.

Propoxyphene[2,3,6]

Streetnames

Yellow footballs, Darvon

Propoxyphene is an opioid structurally similar to methadone. It is a widely prescribed narcotic analgesic with a potency approximately one half that of codeine when each is orally administered. Typical oral doses of propoxyphene have about the same analgesic effect as 600 mg aspirin. It is prescribed most often as a combination with acetaminophen or salicylate.

Propoxyphene is rapidly absorbed and undergoes extensive hepatic first-pass metabolism to norpropoxyphene. The elimination half-life of propoxyphene is about 15 hours (8–24 hours), and that of norpropoxyphene is 27 hours (24–34 hours). Norpropoxyphene may contribute to the analgesic and cardiotoxic effects of propoxyphene. Propoxyphene overdose may result in nausea, vomiting and drowsiness, and in more severe cases, CNS depression, convulsions, respiratory depression and cardiovascular collapse. Cardiac arrthythmias atypical for opioid overdose is thought to be due primarily to norpropoxyphene. Death, usually a result of respiratory depression and cardiac arrthythmia, is more common when propoxyphene is ingested with another CNS depressant such as alcohol.

Propoxyphene and norpropoxyphene may be quantitated in serum by GC or HPLC, but because of the poor correlation between serum concentration and degree of impairment or prognosis, such quantitative information is generally not helpful in cases of propoxyphene overdose. However, their qualitative identification in urine may be useful to help confirm or establish the cause of a patient's symptomatology. Because propoxyphene is frequently taken in combination with acetaminophen or aspirin, quantitation of the latter in serum is advisable to assess possible acetaminophen or salicylate toxicity.

Naloxone (Narcan) is effective in reversing the CNS and respiratory depressant actions of propoxyphene but has little effect on the cardiotoxicity.

The initial screening test for propoxyphene is most often immunoassay. For confirmation of a presumptive positive, a quantitative drug measurement is performed using GC/MS. Immunoassays for propoxyphene are designed for the detection of the parent drug; cross-reactivity with norpropoxyphene, present in much greated concentrations than the parent drug, is weak positive, especially for EMIT. In general, propoxyphene may be detected for about 2 days following use.

Cannabinoids (Cannabis)[1,2,3,7,8]

Streetnames

Dagga, Dope, Dube, Zol, Skuif, Joint, Grass, Boom, Weed, Green, Hash, Pot, Ganja, Giggle twig, Hashish

Cannabinoids are a group of C21 compounds found in the plant species Cannabis sativa. The principal psychoactive cannabinoid is Δ9-tetrahydrocannabinol (THC).

THC is most often consumed by smoking marijuana, which is a mixture of crushed leaves, flowers and sometimes stems from the cannabis plant. Hashish – the dried, resinous secretions of the plant – may also be smoked. Hashish generally has a higher content of THC than does marijuana.

The major psychoactive effects of THC are euphoria and a sense of relaxation and well-being. These effects occur within minutes of smoking marijuana, reach a peak in about 15–30 minutes, and may persist for 2–4 hours. Associated with this "high" are a loss of short-term memory and impairment of intellectual performance (recall, reading comprehension, ability to concentrate and mathematical problem solving). Moreover, psychomotor skills may be sufficiently impaired to adversely affect automobile or aeroplane operating performance.

Some controversy exists concerning the degree of impairment of performance much beyond 4 hours after marijuana use. Even greater uncertainty surrounds the long-tern negative health effects of a chronic marijuana user. Tolerance and a mild degree of physical dependence may develop after chronic marijuana and hashish use.

After inhalation of marijuana smoke, THC is rapidly absorbed through the lungs and reaches peak blood concentration within minutes; thereafter, blood concentration rapidly declines to about 10% of peak levels within 1–2 hours. This rapid decline in THC concentration is the result of its facile distribution to tissues such as the brain, fat and muscle. The rapid tissue distribution phase, a consequence of the lipophilic nature of THC, is followed by a slow redistribution of THC back into the blood stream and subsequent hepatic elimination.

The terminal elimination half-life of THC is about 1 day in casual marijuana users and 3–5 days in chronic users. The peak psychoactive effects of THC generally lag behind the peak blood concentration by about 20–30 minutes. Undoubtedly, the concentration of THC in venous blood poorly reflects the THC concentration in the brain.

While marijuana is the most frequently used illicit drug, it does have some limited legitimate medicinal use. Dronabinol (Marinol) contains synthetic THC and is used to treat anorexia and nausea in AIDS patients, nausea and vomiting associated with chemotherapy and asthma and glaucoma.

THC is extensively metabolized to a large number of compounds, most of which are inactive. The principal urinary metabolite is 11-nor-Δ9-tetrahydocannabinol-9-carboxylic acid (THC-COOH) and its glucuronide conjugate. Immunoassays designed to screen urine samples for marijuana use measure this and its THC metabolites. These assays are calibrated with THC-COOH, but because of cross-reactivity with many other THC metabolites, quantitative results based on them are 1.5–8x greater than the actual concentration of THC-COOH as determined by GC/MS. Therefore, immunoassay results are interpreted as THC-COOH equivalents. Because of the slow release of THC from tissue storage sites, urine may test positive for THC metabolites (>20 ng/mL THC-COOH equivalents) for 2–5 days after last marijuana use by infrequent smokers; some individuals may test positive for as long as 10 days. Chronic smokers may test positive for 3–4 weeks after abstinence. Some heavy smokers may remain positive for up to 46 days and may require as long as 77 days to test negative for 10 consecutive days. Therefore, a positive urine test for THC-COOH can only be interpreted to indicate past marijuana use (immediate to several weeks) and is unrelated to impairment.

Due to fluctuations in fluid excretion, the concentration of THC metabolites in urine may vary between positive and negative values when sequentially measured after several days of abstinence. In this case, an increase in metabolite concentration could falsely imply reuse of marijuana. Therefore, to monitor abstinence properly, the concentration of THC-COOH should be expressed per mg of creatinine. An increase in 50% or more from the previous value implies reuse.

Cannabis

Legitimate concern has been raised about the possibility of passive inhalation of sufficient sidestream marijuana smoke from nearby users to result in a positive urine cannabinoid test. It has been demonstrated that such can occur but under rather unrealistic conditions. Under more normal circumstances, passive inhalation did not result in a urine THC-COOH concentration in excess of 12 ng/mL.

Nevertheless, as a precaution against passive inhalations resulting in a positive test, some laboratories screen for urine cannabinoids at a cut-off concentration of 100 ng/mL THC-COOH equivalents.

Appearance

Dried herb or resinous block.

Ingredients

Derived from Cannabis sativa, a plant containing tetrahydrocannabinols.

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An exposure assessment of a laboratory assistant to hazardous chemical substances

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Abstract

A survey was conducted to measure exposure to hazardous chemical substances of a laboratory assistant working in a university laboratory, who complained of symptoms that could be indicative of chemical absorption. This case study describes the survey to quantify the exposure in order to determine whether it exceeded safety limits and recommend preventative measures if indicated. Exposure was sampled using a direct reading photo-ionization detector and coconut charcoal sorbent tubes. An additive effect between the different hazardous chemicals was identified. The 8-hour TWA exposure to acetone and dichloromethane was well below the occupational exposure limits, but was more than double the OEL-RL for chloroform. It was also likely that the OEL-STEL for dichloromethane (methylene chloride) was exceeded. Immediate removal for medical assessment and improved preventative measures were recommended.

Key words: exposure assessment, hazardous chemical substances, laboratory assistant

Introduction

A laboratory assistant complained of headaches and dizziness. This person has been an employee of a South African university for the past 12 years, and is responsible for the collection, decanting and distribution of various hazardous chemical substances (HCS) from a chemical storeroom to a number of laboratories on campus. An HCS may present a hazard as a result of contact with the body or absorption into the body through the skin, by ingestion or inhalation.[1] HCSs can be classified as carcinogens, haematopoietic system toxins, hepatotoxins, nephrotoxins, neurotoxins and agents that damage the skin, eyes or mucus membranes.[2]

After receiving the complaints, a health and safety audit was conducted which noted inadequate and incorrect use of personal protective equipment when distributing the chemicals. These events led to a survey to measure exposure to HCSs in an individual who complained of symptoms that could be indicative of chemical absorption. Exposure was sampled using a direct reading photo-ionization detector (PID) and coconut charcoal sorbent tubes. The purpose of this case study is to describe the survey that was conducted to quantify the exposure of the laboratory assistant to multiple HCSs, in order to determine whether this exposure exceeded safety limits and recommend preventative measures if indicated.

Case description

Chemical storeroom

The storeroom has a volume of approximately 22,5 m^3. The floor is a steel grid with a spillage sand pit 1m below floor level. It has an extraction fan which is not operational, one door and no windows.

Task description

A number of chemicals are purchased in large quantities (up to

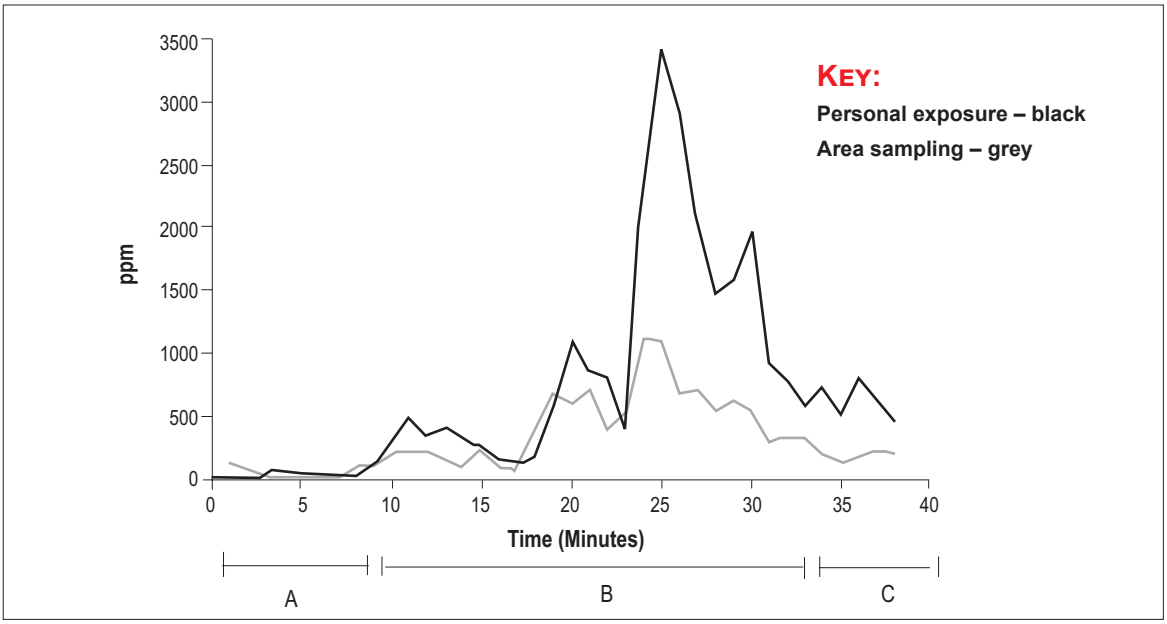

Figure 1. Personal exposure to HCS according to a direct-reading PID. A) Entry into the storeroom and preparation, (B) performing tasks, (C) placing filled bottles outside and preparing for transport

25 ℓ), and stored in the storeroom. Twice a week the laboratory assistant opens these large containers and, using a small funnel, he pours the chemical into smaller glass bottles (2.5 ℓ). This method is repeated for every glass bottle. The number of bottles and type of chemical he decants depends on the laboratory requests, and this differs every day. The bottles are then distributed to the laboratories. During the decanting, large volumes of the chemical are spilled, and this unavoidably releases vapours into the atmosphere of the store room. The laboratory assistant then wipes the spilled chemical from the bottles with a cloth, and leaves the cloth on a shelf in the storeroom. The personal protective equipment issued to the employee consisted of a laboratory overcoat, household cleaning gloves and an FFP1 particulate dust mask.

this case the source of VOC emissions were from storage and use of solvents. Once the employee entered the storeroom, readings started to increase, even prior to him performing his task. The door of the storeroom was kept open for the duration of the task. This particular day was chosen based on the large amount of chemical bottles that had to be filled. The particular chemicals transferred (in total 25 bottles of 2.5 ℓ each) were dichloromethane (13), ethanol (2), acetone (2), ethyl acetate (7) and chloroform (1). Figure 1 illustrates the employee's personal and area exposure to HCS while performing his tasks. Personal exposure (black) was measured in the breathing zone of the laboratory assistant. Area sampling (grey) was measured in the storeroom where the task was performed 1.5 m above floor level. During this time there was a period of 7 minutes where personal exposure was very high with an average of

"The results emphasise the importance of not only TWA-8h exposure sampling but also short-term exposures sampling."

Personal exposure

As noted above, a direct reading PID and coconut charcoal sorbent tubes were used to measure the laboratory assistant's exposure. The PID instrument (EntryRAE, RAE Systems Inc.) recorded the total number of volatile organic compounds present in the breathing zone as personal exposure as well as area exposure in the storeroom atmosphere during the measurement. A VOC can be defined as any chemical compound based on carbon chains or rings and contains hydrogen, with a vapour pressure greater than 2 mm of mercury at 25°C.[3] The PID for VOC broadband detection uses a 10.6 eV lamp to detect a wide variety of gases. Any compound with ionization energy lower than that of the lamp photons can be measured. The detector can detect just a few parts per million of these compounds.

The sorbent tubes (SKC International, product code 226-01) provided the specific concentrations of personal exposure to acetone, dichloromethane and chloroform. This was determined by following the NIOSH method 1500 and subsequent analysis by an accredited laboratory. Sampling was conducted for the duration of the laboratory assistant's tasks in the storeroom, which was 38 minutes. TWA for an eight-hour shift was calculated with the understanding that the laboratory assistant was not exposed to any HCS for the remainder of the workday.

No detectible background levels of VOCs were recorded outside the chemical storeroom on the direct reading PID. In 2258.4 ppm (maximum exposure of 3423.8 ppm).

Analysis of the sorbent tube only detected acetone, dichloromethane and chloroform (see Table 1).

Discussion

As indicated in Table 1, the 8 hour TWA exposure to acetone and dichloromethane was well below the occupational exposure limits, but was more than double the OEL-RL for chloroform. Although short-term exposure was measured for 38 minutes the OEL-STEL for dichloromethane (methylene chloride) is in all likelihood exceeded during the sampling period. The Regulations for Hazardous Chemical Substances[4] do not list an OEL-STEL for chloroform, however the exposure to chloroform exceeded the NIOSH OEL-STEL of 2 ppm.[6] If the South African TWA OEL is multiplied by three to give an indication of an OEL-STEL (6 ppm), the short-term exposure to chloroform is 8.36 times above the OEL-STEL.

According to the ACGIH both chloroform and dichloromethane are confirmed animal carcinogens with unknown relevance to humans.[7] Both chloroform and dichloromethane cause central nervous system depression with symptoms of headache, dizziness, nausea and reduced coordination.[8,9] Consequently the results of exposure to both chloroform and dichloromethane simultaneously and their possible additive effect would explain the employee's complaints of headaches and dizziness. Liquid

Table 1. Personal exposure to HCS and occupational exposure limits according to the Regulations for Hazardous Chemical Substances of South Africa.[4,5]

	Eight hour (calculated TWA)		Duration of task (38 minutes)	
	Employee's exposure# ppm	OEL-TWA ppm	Employee's exposure ppm	OEL-STEL ppm
Acetone	1.23	750	14.04	1500
Chloroform	4.39	2	50.13	-
Dichloromethane*	33.93	100	387.79	-

* Control limit. Also indicated as methylene chloride with a recommended limit (Table II) of OEL-TWA of 100 ppm and an OEL-STEL of 250 ppm.[4]

TWA for an eight-hour shift was calculated with the understanding that the laboratory assistant was not exposed to any HCS for the remainder of the workday.

dichloromethane is a moderate to severe irritant when it comes in contact with skin. Long-term exposure to dichloromethane may lead to dermatitis and neurological effects as well as liver impairment.[9] Chronic exposure to chloroform by inhalation is associated with effects on the liver and central nervous system, such as depression and irritability, and effects on the heart.[10]

The additive effect of mixed exposure to various HCS can be calculated according to $C_1/T_1 + C_2/T_2 + C_3/T_3$ where C is the observed concentration, and T is the corresponding threshold limit.[6] The calculated additive effect of the laboratory assistant's exposure to hazardous chemical substances exceeded 1 (2.54) which indicates that there was an additive effect between the different hazardous chemicals. Additive effect refers to the combined effect of two or more hazardous substances that have a similar toxicological effect on the same target organ or system.[7]

The laboratory assistant was not adequately equipped with PPE, as the FFP1 dust mask he was issued is not suitable for use with chemicals, and provided no protection against the vapours. The household cleaning gloves also did not provide sufficient protection against spillages of chemicals. The ventilation system in the storeroom was not functional, and the only method of ventilation was provided by the open door. The decanting method was not suitable, as large volumes of chemicals were spilled which increased the laboratory assistant's exposure.

As this survey was only conducted on one day, his exposure to other chemicals in the storeroom was not measured. Measurement should be repeated to include all possible exposures.

Conclusion and recommendations

The short-term exposure of the laboratory assistant to chloroform and dichloromethane probably exceeded the OEL-STEL concentrations. The TWA exposure to chloroform exceeded the OEL-TWA concentration. Additive effects of exposure to a mixture of chemicals, in this case acetone, chloroform and dichloromethane, are indicated.

The results emphasise the importance of not only TWA-8h exposure sampling but also short-term exposures sampling. These clarify the extent and duration of peak exposures when planning and assessing exposures of workers to HCS, as well as the effects of exposure to various hazardous chemicals simultaneously.

In the Regulations for Hazardous Chemical Substances of 1995, dichloromethane is listed in Table I with a control limit, but methylene chloride is listed in Table II with a recommended limit.[4] These are synonyms for the same chemical. As dichloromethane is a suspected human carcinogen, it should therefore only be listed in Table I and methylene chloride should be removed from Table II.

This study led to valuable information provided to the laboratory assistant's supervisor in order to improve his working conditions. The laboratory assistant was issued with new PPE, and further recommendations were made to improve the working environment of the worker. Due to the absence of any assessments or monitoring, and the presence of possible symptoms related to long-term exposure to solvents, it was recommended that the employee be withdrawn immediately and referred to an occupational health practitioner for a physical evaluation and other tests necessary to determine his health status. The employee was also occasionally exposed to HCS listed in Table III[4] such as methanol and should also be placed under medical surveillance for this exposure. Spillages can be prevented by using appropriate siphoning equipment. The extraction fan should be repaired and the adequacy of its operation verified. The employee should be supplied with the appropriate personal protective equipment (PPE), such as gloves and correct respiratory protection to reduce his exposure to HCS. The employee should receive training and education on the correct use, maintenance and replacement of PPE.[4,5]

Lessons learned

- Simultaneous exposure to various chemicals with similar toxicological effects may have an additive effect.
- The importance of short-term exposure cannot be over emphasised to determine peak exposures.
- TWA-8h exposure sampling together with short-term exposures sampling clarify the extent and duration of peak exposures when planning and assessing exposures of workers to HCS, as well as the effects of exposure to various hazardous chemicals simultaneously.

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Detection of environmental *Mycobacterium tuberculosis* using rapid and sensitive conventional and real time polymerase chain reaction

Abstract

Noninvasive methods which are rapid and sensitive enough to detect and quantify airborne *Mycobacterium tuberculosis* would be a significant advance towards controlling MTB exposure in occupational settings in South Africa. The polymerase chain reaction (PCR) method has been used but it may yield false negative results and evidence is lacking to support the use of different filter types. The purpose of this study was to detect and quantify *Mycobacterium tuberculosis* from various sampling media using rapid and sensitive conventional and real time PCR. Environmental samples were collected with PTFE, PC, gelatin and sedimentation gel sampling media and analysed using molecular techniques. Using conventional PCR, PTFE yielded positive results (96.43%) when compared with gelatin filters, which were negative with 100% inhibition. All the samples were positive using RT-PCR except the sedimentation gel. RT-PCR coupled with magnetic bead separation yielded positive results (no inhibition) demonstrating 100% sensitivity, irrespective of sampling media used. The quantitative RT-PCR gave favourable results for the expected known MTB concentrations. In conclusion, this study demonstrated the usefulness of RT-PCR for detecting MTB in environmental samples with the aim of controlling exposure. It also emphasised the importance of the sampling media compatibility with the analytic instrument to overcome inhibition.

Key words: *Mycobacterium tuberculosis*, environmental sampling, polymerase chain reaction, occupational exposure

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Background

Mycobacterium tuberculosis (MTB) infection remains a major public health concern globally,[1] and South Africa has the 7th highest TB incidence in the world.[2] The recent XDR-TB outbreak among HIV-coinfected patients in South Africa undermines TB control efforts in this resource-strapped country.[3] MTB is also problematic in occupational settings contributing to the deterioration of health and loss of economic productivity in many countries.[4-8] These include healthcare facilities,[9-11] correctional services, rehabilitation centres, nursing homes, healthcare waste treatment facilities,[12] funeral homes,[13] mortuaries or anatomy departments and the mining industry,[13-15] most of which are overcrowded. Currently there is no occupational exposure limit for MTB, however the Hazardous Biological Agents Regulation under the South African Occupational Health and Safety Act (Act No 85 of 1993) categorises MTB as a class 3 organism (causes severe human disease which presents a serious hazard to exposed persons).[16]

Droplet nuclei that transmit TB infection have long remained a research focus due to the difficulties in detecting infectious MTB. The organisms are present in low concentrations in indoor air, slow growing (more than 6 weeks), and may be non-culturable due to stress of aerosolisation and sampling.[17-24] A few studies[10,11,25-27] to detect airborne MTB have been done in several countries, including South Africa. The increasing prevalence of TB in the mining industry prompted the first study in South Africa,[27] but although it was able to detect non-tuberculous mycobacteria (NTB) it failed to detect MTB. An ongoing study[28] in Witbank, South Africa, similar to that done by Riley,[29] focuses on infectivity of MTB by utilising air from patient wards which is linked to exposure chambers housing guinea pigs. MTB infectiousness is recognised and well documented however little is known about the aerodynamics of MTB.[1,30,31] A better understanding would be useful to evaluate the risk of these infectious agents in an attempt to reduce exposure and control disease. For these reasons, noninvasive methods which are rapid and sensitive enough to detect and quantify airborne MTB would be a significant advance towards controlling MTB exposure in occupational settings in South Africa. Such a method would aid in establishing the need for control measures, testing the efficacy of control systems already in place, comparing various control methods, and detecting risks in unusual or unexpected settings previously thought to be safe.

The polymerase chain reaction (PCR) method has been used in previous studies for direct detection of airborne MTB in environmental samples.[9-11] A recent study adapted the

commercial MTB PCR test kit for direct detection of MTB complex in hospital air samples.[11] This assay allows the detection of target nucleic acid DNA sequences; and has potential for use in detecting lower concentrations of airborne microorganisms. It should also be borne in mind that polymerase chain reaction (PCR) may yield false negative results due to inhibitory substances, with more significant inhibition in outdoor air samples than indoor samples.[11,32] Questions also arise as to the suitability of the collection medium as this may also impact on the quality of results. Although Gwo-Hwa[9] et al. demonstrated that polycarbonate (PC) and polytetrafluoroethylene (PTFE) filter membranes were comparable for MTB environmental sampling, evidence is lacking to support the use of other filter types (e.g. gelatin based filters) for bioaerosol sampling and subsequent detection.

This paper summarises the findings of a pilot study using conventional and real time PCR to detect and quantify MTB in environmental samples and places emphasis on the importance of sampling media and their compatibility with laboratory resources (e.g. equipment availability, technical skills).

Methodology

The study was conducted from 2006 to 2008. *Mycobacterium tuberculosis* ATCC® 25177™ (H37Ra) was used throughout the study at a concentration of 1x108 cells/ml adjusted with 0.5 McFarland standard.

Aerosolisation and air sampling

Different filters (PTFE, PC and gelatin coated filters, SKC Inc, USA) and sedimentation gel plates[11] (Sigma Aldrich Inc, USA) were subjected to the aerosolised MTB strain in a dead box (~0.254 m^3) at a flow rate of 2.5 L/min for 20 minutes (Aircheck 52, SKC Inc., USA) and 50 L for 30 seconds (MAS 100 air sampler, Merck, USA), respectively.

Sample extraction

The respective filter membranes were extracted according to an established method.[33] The extraction of the sedimentation gels were performed separately accordingly to the method described by Vadrot et al.[11] The sample extracts were stored at -20°C prior to analysis.

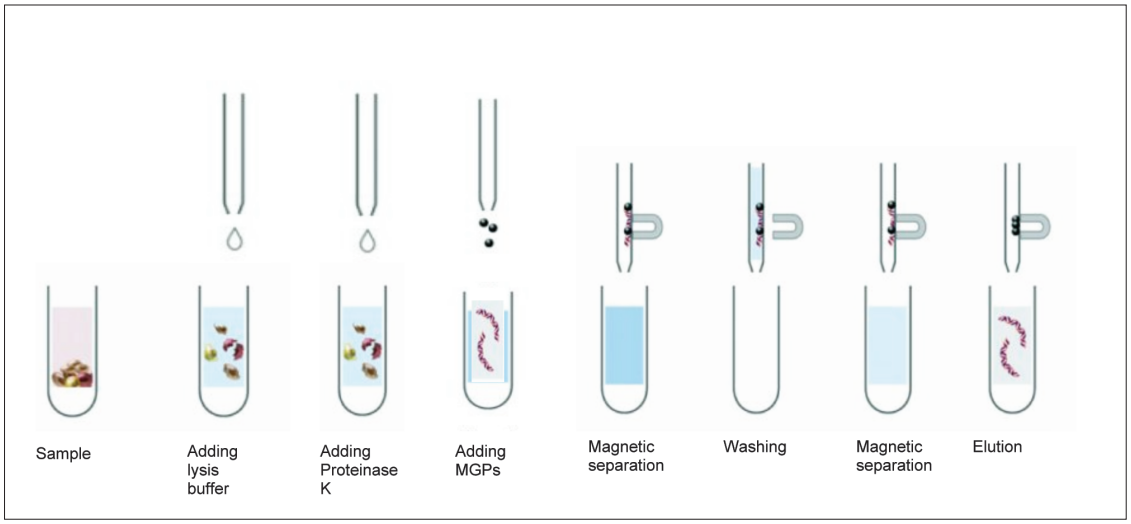


Figure 1. A schematic diagram of nucleic purification using the magnetic bead separation method[34]

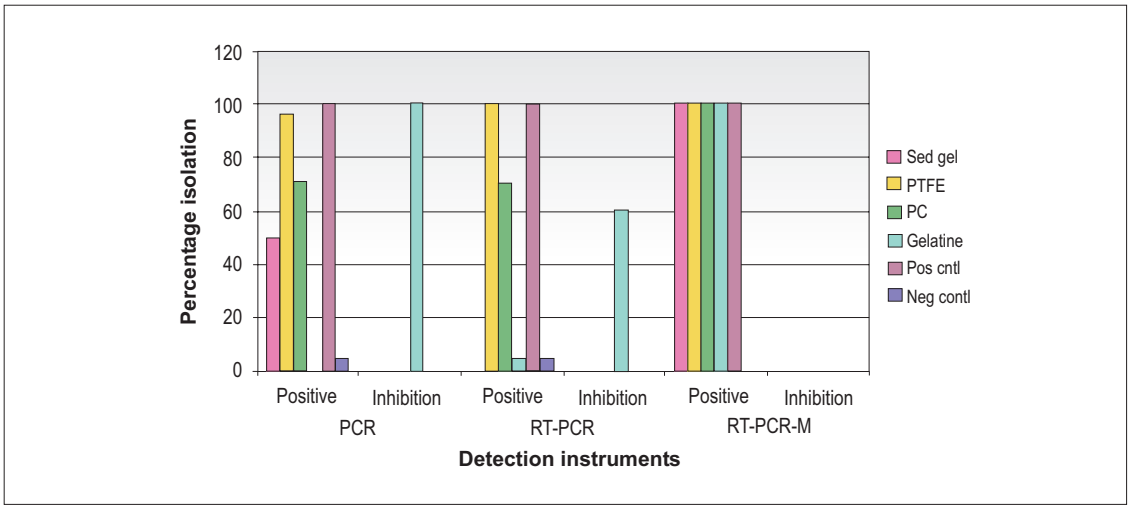


Figure 2. Conventional and real time PCR with the combination of magnetic bead separation highlighting the different filter types and sedimentation gel results; comparing positive and inhibition results

Analysis using conventional and real time PCR

Detection of MTB was done by conventional nucleic acid amplification of the 16s rRNA gene using an adapted Roche Amplicor PCR test according to the manufacturer's instructions, whilst real time PCR (RT-PCR) was performed using the LightCycler. RT-PCR is similar to conventional PCR except that it accumulates amplified specific DNA fragments. Colorimetric detection for conventional PCR was obtained at an optical density of 450 nm (GeneAmp PCR system 2400, Perkin Elmer) whilst RT-PCR using fluorophores (SYBR Green) intercalated with doubled stranded DNA was read at 640 nm. The number of DNA copies was determined by extrapolation from a standard curve generated from a known starting concentration of MTB.

Magnetic bead separation

The principle involved is the use of magnetic glass beads binding to the target extract DNA and the removal of cellular debris by the washing steps, resulting in the elute containing high purity DNA (see Figure 1) (Roche MagnaPure Nucleic Acid isolation kit). The purified extract was analysed using RT-PCR.

Quality control measures and aseptic techniques were applied throughout the sampling process and laboratory analysis. All statistical analyses were carried out using the Stata statistical package (version 9).

Results

Using conventional PCR 96.43% (27/28) of samples extracted from PTFE filters yielded positive results as opposed to the samples from gelatin filters which yielded negative MTB results (0%) but 100% inhibition (see Figure 2). The sedimentation gel detected 50% MTB in 14/28 samples, with no inhibition detected. Seventy-one percent (20/28) of PC filters were positive for MTB with no inhibition.

When using RT-PCR, extracts from all sampling media gave positive results with the exception of the sedimentation gel (see Figure 2). Once again the PTFE filter appeared superior compared to the other filters.

When the magnetic bead separation method was applied, all samples from the various sampling media were positive with no inhibition noted (see Figure 2).

"Questions . . . arise as to the suitability of the collection medium as this may also impact on the quality of results."

Sensitivity and specificity of test methods

The sedimentation gel with RT-PCR M detection method had a sensitivity (SN), specificity (SP), positive predictive value (PPV) and negative predictive value (NPV) of 90% (Table 1). Conventional PCR demonstrated much lower diagnostic indicators; SN (28.6%), SP (78.5%), PPV (57.1%) and NPV (52.4%). With RT-PCR only, SP and NPV values were obtained. Gelatin filter extracts produced negative results for all instruments.

Quantitative RT-PCR (RT-qPCR)

Figure 3 shows the calibration curve of known MTB DNA concentrations and threshold cycle by real time qPCR. The

Table 1. Summary of the measurement indicators for all combinations of sampling types and detection methods using 95% confidence intervals

Sampling types	Detection methods	Measurement indicators			
		SN %[A]	SP %[B]	PPV %[C]	NPV %[D]
Sedimentation gel	PCR	28.6 (13.2 - 48.7)	78.5 (59.1 – 91.7)	57.1 (28.9 – 82.3)	52.4 (36.4 – 68)
	RT-PCR	0 (0)	100 (69.2 – 100)	0 (0)	50 (27.2 – 72.8)
	RT-PCR M	90 (55.5 – 99.8)	90 (55.5 – 99.8)	90 (55.5 – 99.8)	90 (55.5 – 99.8)
PTFE	PCR	96.4 (81.7 – 99.9)	100 (87.2 – 100)	100 (87.7 – 100)	96.6 (82.2– 99.9)
	RT-PCR	100 (69.2 – 100)	100 (69.2 – 100)	100 (69.2 – 100)	100 (69.2 – 100)
	RT-PCR M	100 (69.2 – 100)	100 (69.2 – 100)	100 (69.2 – 100)	100 (69.2 – 100)
PC	PCR	66.7 (44.7 – 84.4)	87.5 (71.0 – 96.5)	80 (56.3 – 92.3)	77.8 (60.9 – 89.9)
	RT-PCR	70 (34.8 – 93.3)	100 (59.0 – 100)	100 (69.2 – 100)	77 (46.2 – 95.0)
	RT-PCR M	100 (69.2 – 100)	100 (69.2 – 100)	100 (69.2 – 100)	100 (69.2 – 100)
Gelatin	PCR	0 (0)	0 (0)	0 (0)	0 (0)
	RT-PCR	10 (0.25 – 44.5)	100 (69.2 – 100)	100 (2.5 – 100)	77 (46.2 – 95)
	RT-PCR M	100 (69.2 – 100)	100 (69.2 – 100)	100 (69.2 – 100)	100 (69.2 – 100)

[A] SN: defined as the proportion (%) of all samples detected as positive.
[B] SP: defined as the proportion of all blanks detected as negative.
[C] PPV: defined as the proportion of all detected positive results that were truly positive.
[D] NPV: defined as the proportion of all detected negative results that were truly negative.

standard curve ranged from 4.6 to 7.8x107 copies/ml with a correlation coefficient (r) of -0.99. The negative correlation results from increasing the number of threshold cycles at low MTB concentrations. The results in Table 2 show that the actual concentrations measured using qPCR were slightly lower (2.4 to 5.6x107 copies/ml) compared to the known MTB sample concentrations expected.

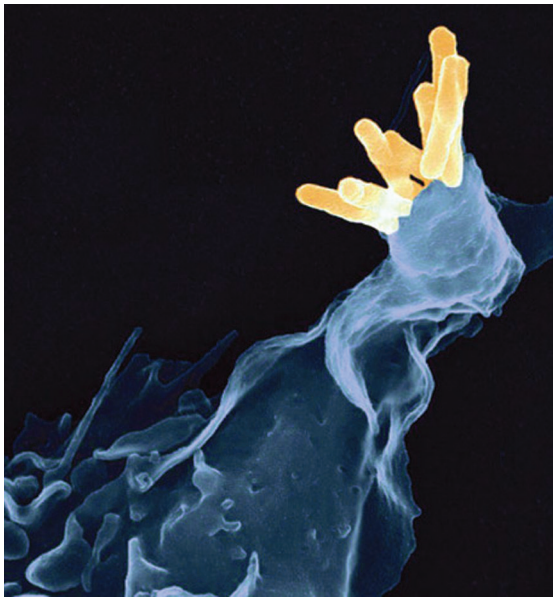
Discussion

Our study has demonstrated that the PCR method can successfully be used for the identification and quantification of MTB from filter membrane (e.g. PTFE and PC) extracts. These findings are similar to those of other studies detecting airborne MTB using PCR.[9,10,35] In this pilot study, the conventional PCR method detected 96.4% positive results for MTB whereas for RT-PCR and RT-PCR with an additional nucleic acid purification step detected MTB in all the samples.

It is of interest that not all sampling media support the detection of MTB using conventional or RT-PCR. Gelatin based filter membranes and sedimentation gels are not good choices for MTB detection. The inhibition was up to 100% using gelatin filter membranes which could result in false negative readings if not interpreted correctly, while the sedimentation gel produced negative results using RT-PCR. It is possible that ingredients in the gelatin filters and sedimentation gels which are agar/gel based contributed to these results. In addition, the sedimentation gel accumulates heavy particles, whereas minute ones can remain airborne for longer periods and be inhaled, underestimating the risk involved.[11] Another shortfall using the sedimentation gel is the extended preparation time of the gel and need for strict adherence to aseptic techniques. It also requires extra steps during the sample extraction process as opposed to the filter membranes. This highlights the importance of selecting appropriate sampling media that are compatible with the analytic instruments and technical skills.

It is evident from this study that the magnetic bead separation step is suitable for overcoming inhibitory properties or interference of the sampling media. It is also well documented that environmental factors such as humic acid, polysaccharides, urea and dust particles may negatively influence the results of air samples, therefore using a purification step prior to PCR is advantageous.[36] This is in agreement with Stetzenbach and colleagues who recommended that internal controls be included in every test done to rule out inhibition.[37]

The selection of the appropriate analytic instrument is also of importance depending on the study question, as the conventional PCR produces a qualitative result for MTB complex (*M. tuberculosis*, *M. microti*, *M. africanum*, and *M. bovis*) while the RT-PCR produces quantitative results for MTB specifically. Qualitative assays (positive versus negative results) lack comprehensive information regarding the health risk of MTB. It is well known that any airborne MTB



Mycobacterium tuberculosis

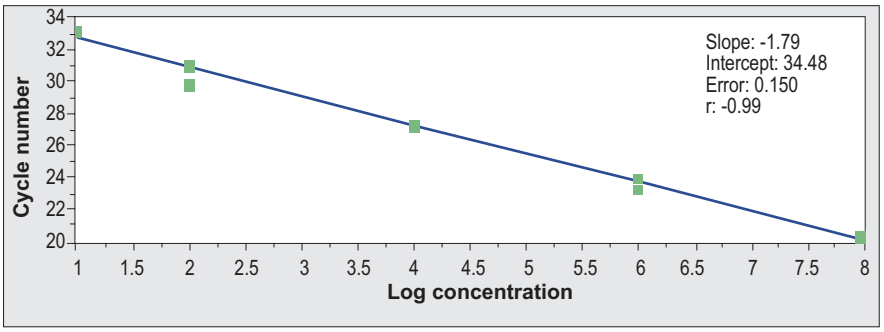


Figure 3. Calibration curve using linear regression of known MTB DNA concentrations and threshold cycle values by real time – qPCR assay

poses some risk and although regulatory standards are not available it stands to reason that the higher the concentration of airborne MTB the greater the risk of infection (personal communication: M Schafer). The results from the current study show that the method employed for detection and quantification is highly sensitive and therefore has potential application as a tool for the assessment of risk to workers.[38] This is particularly useful in South Africa with a high prevalence of HIV-TB co-infection,[39,40] as it has previously been demonstrated that HIV-positive patients with inadequately treated MDR-TB are highly infectious.[31]

The increase of occupationally-related TB cases highlights the importance of establishing a method to be able to identify exposure and thereby contribute to control strategies. Previous studies using culture methods and animal models for the detection and infectivity of airborne MTB have proved to be problematic. In addition, animal models raise animal ethics concerns and do not always closely approximate the human model (personal communication: M Schafer), as well as being expensive and cumbersome.

PCR methodology to date has surpassed these difficulties in that it permits the detection of cells regardless of their metabolic state and may be more sensitive than culture or animal methods. Molecular advances have been made to detect multi-drug resistant TB (MDR-TB)[31,41] and extreme-drug resistant TB (XDR-TB)[42] in addition to living and dead organisms[43] using PCR. This certainly warrants further investigations on reporting viable cells instead of total count of the aerosolised TB bacilli. Recent PCR studies have used mRNA antigen 85B (Ag85B) to detect viable MTB.[43] Alternatively, fluorescent microscopy (Live/dead Baclight assay, Molecular Probes, Inc., Eugene, OR) can also be used to address the issue of viability. Apart from viability, transmission and subsequent infection is also dependent on type of strain and virulence.[31] Previous studies showed that the use of chemicals or disinfectants (e.g. formaldehyde,[14] gluteraldehyde, ethanol[44]) are ineffective in rendering the cells inactive but may reverse the dormancy state through osmotic stress. These settings may underestimate the actual risk of exposure to MTB.

The NIOH Bioaerosol Laboratory is embarking on the main study which will address the viability and quantification of MTB in healthcare settings in South Africa to evaluate the hazard to health professionals.

Table 2. Quantitative PCR analysis of known MTB concentrations

Expected cell concentration/ml	Actual copies/ml
$1x10^8$	$5.6x10^7$
$1x10^6$	$7.3x10^5$
$1x10^4$	$7.1x10^3$
$1x10^2$	$2.3x10^2$
$1x10^1$	$2.4x10^0$

Please note: one DNA copy per bacterial cell

Conclusion

This study demonstrates the usefulness of conventional and real time PCR for the detection of MTB in environmental samples. It provides evidence on the importance of sampling media selection and compatibility with analytic instruments to overcome inhibition. Furthermore, it highlights the sensitivity and specificity of the analytic method and has demonstrated the best results with RT-PCR coupled with magnetic bead separation. This may prove useful for air monitoring and to quantifying the risk to exposed workers, in addition to managing the exposure.

"... the magnetic bead separation step is suitable for overcoming inhibitory properties or interference of the sampling media."

Acknowledgement

We are thankful to the NIOH for supporting this work.

Lessons learned

- Sample inhibition and/or interference can be overcome by using RT-PCR coupled with magnetic bead separation.
- Conventional PCR produces a qualitative result for MTB complex (*M. tuberculosis*, *M. microti*, *M. africanum*, and *M. bovis*) while the RT-PCR produces quantitative results for MTB specifically.
- Air sampling combined with PCR could be useful for air monitoring and to quantify the estimated risk to exposed workers.
- The selection of the appropriate media which is compatible with analytic instrument is also of importance in obtaining reliable results.
- PCR provides a rapid and sensitive method for the detection of MTB in environmental samples.

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Self-reported musculoskeletal disorders among office workers in a private hospital in South Africa:

prevalence and relation to physical demands of the work

Abstract

Few studies have investigated musculoskeletal disorders among office workers in South Africa. The aim of this quantitative cross-sectional descriptive survey was to determine the prevalence of self-reported musculoskeletal disorders among office workers in a private hospital and to assess the association between the physical demands of their work and musculoskeletal disorders. Of the participants, 76.1% had at one point in time been absent from work due to backache or other musculoskeletal problems. The most commonly affected regions were the back followed by the neck, wrists and shoulders. Furthermore, the prevalence of MSDS was associated with the physical work demands of the work, particularly between repetitive motions of upper limbs, and wrist extension when using the keyboard and forceful movements. No significant association between musculoskeletal disorders and gender, period of employment and age among the participants was observed.

Key words: musculoskeletal disorders, prevalence, office workers, self-report, ergonomics

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Introduction

Musculoskeletal disorders (MSDs) are a major source of disability and lost time from work.[1] The global increase in computer work is coinciding with an increased prevalence of work-related MSDs.[2,3] Assessing the exposure of workers to known risk factors for MSDs is essential for the introduction of primary interventions, including the application of ergonomic knowledge and principles to understanding MSDs amongst those using computer technologies.[2,3]

Many international studies have investigated risk factors for MSDs amongst computer workers. Juul-Kristensen & Jensen conducted a prospective survey among office workers involved in repetitive computer work in order to determine the frequency of self-reported musculoskeletal symptoms during the previous 12 months.[4] Less men than women reported musculoskeletal symptoms, and areas most affected were the neck/shoulder (39%), elbow/hand (51%) and the lower back (47%).[4] Participants who spent 75% and more of their work time on the computer were at risk of experiencing musculoskeletal symptoms in the neck/shoulder and elbow/hand. Furthermore, the speed of work was related to the lower back symptoms.[4]

Female computer users appear more at risk for MSDs than males.[5] Other ergonomic factors such as static work posture, hand positioning, lower arm support, repetitive work movements, and the use of a keyboard were associated with the risk of MSDs.[5] In another study, females reported a reduced productivity due to musculoskeletal symptoms, and the reduction was weakly associated with computer mouse position and task and symptom persistence for both men and women.[6] For women, work demands, computer problems, and being divorced/separated were also associated with reduced productivity.[6]

A South African study of hospital workers on factors associated with low back pain reported a point prevalence of 47.46% and revealed that gender, age and stress perceived at work were significantly associated with low back pain among these workers.[7] Another South African study confirmed that lower back pain was associated with an increased absence from work coupled with a decline in productivity.[8]

Sick leave due to MSDs among manual and office workers in a French company, showed that women had a higher risk of developing MSDs and the incidence increased with

age, as older workers took more sick leave due to MSDs of the upper limbs.[9]

During the course of his work, the researcher observed an increasing number of office workers in a private hospital reporting musculoskeletal problems and seeking physiotherapy. This, coupled with the paucity of data on MSDs among employees in the private sector in South Africa, motivated the researchers to conduct a survey among this group of workers to investigate the possible link with the nature of their work. The aim of the study was to determine the prevalence of self-reported musculoskeletal disorders among office workers and to assess the association between the physical demands of their work and MSDs.

Methodology

A quantitative cross-sectional descriptive survey was conducted using self-administered questionnaires. The study population was 85 employees who were involved in administrative duties in various departments/units at the targeted private hospital. The group comprised all 81 administrative workers, i.e. receptionists, and their four supervisors. The prevalence of MDSs was determined by asking participants if they were absent from work due to backache or any other musculoskeletal related problem at any time during their employment in this job. In addition to demographics, they were also questioned about the most commonly affected region and the frequency of absenteeism due to MSDs, as well as the physical demands of their work. Ethical approval was obtained from Medunsa Research and Ethics Committee (Clearance no: MREC/PH/73/2008). Permission to conduct the study was obtained from the senior management of the study site and all participants gave informed written consent. Anonymity was ensured by not using identifying details such as the participants' names so that data could not be linked to the participants.

The SPSS version 14 was used for descriptive and inferential statistical analysis. For the latter, Pearson chi-square and Fisher's exact tests were applied to test associations and a p-value of less than 0.05 was considered statistically significant.

Results

A response rate of 85.9% (N = 71) was achieved. Data was omitted for some variables and anonymity prevented follow-up to obtain it. Table 1 shows the participants' socio-demographic characteristics. The majority (82%) were female and 'Black' (97.3%). Ages ranged from 21 to 58 years and the mean age was 33.93 years (SD = 7.91). The average number of years of employment was 8.87 with a range from four months to 27 years (SD 8.37).

The majority of participants (54) reported being absent from work due to backache or any other MSDs at some time during their employment in this job. Therefore, there was a 76.1% prevalence of MSDs. Of these, the back was the most commonly affected region (51 or 71.8%) as opposed to the neck, shoulder and wrists (20 or 28.2%).

Associations between socio-demographic characteristics and absenteeism due to MDSs are summarised in Table 2.

Table 1. Participants' socio-demographic characteristics (N = 71)

Characteristic	n	%
Gender		
Male	12	16.9
Female	59	83.1
Total	**71**	**100.0**
Age		
20 – 29 yrs	21	29.6
30 – 39 yrs	32	45.1
40 yrs and above	16	22.5
Missing	2	2.8
Total	**71**	**100.0**
Race		
Black	69	97.2
Indian	0	0.0
White	0	0.0
Coloured	1	1.4
Missing	1	1.4
Total	**71**	**100.0**
Marital status		
Married/living together	37	52.1
Divorced/separated	3	4.2
Widowed	0	0.0
Single/no relationship	28	39.4
Missing	3	4.2
Total	**71**	**100.0**
Religion		
Christianity	65	91.5
Hindu	0	0.0
Islam	0	0.0
Traditional	5	7.0
Other	1	1.4
Total	**71**	**100.0**

Characteristic	n	%
Occupational Role		
Receptionists	69	97.2
Supervisors	2	2.8
Total	**71**	**100.0**
Department		
Admin	2	2.8
Doctors' rooms	40	56.3
ICU	2	2.8
Maternity Ward	2	2.8
Medical Ward	1	1.4
OPD	11	15.5
Paediatric Ward	3	4.2
Pharmacy	2	2.8
Reception	3	4.2
Surgical Ward	4	5.6
X-ray	1	1.4
Total	**71**	**100.0**
Period of employment		
≤1.00 yr	7	9.9
1.01 – 6.00 yrs	46	64.8
6.01 – 11.00 yrs	10	14.1
11.01+ yrs	7	9.9
Missing	1	1.4
Total	**71**	**100.0**
Education/qualification		
Primary education	1	1.4
Matric	33	46.5
Diploma	36	50.7
Degree	0	0.0
Missing	1	1.4
Total	**71**	**100.0**

Females reported a higher frequency of absence from work due to backache or any musculoskeletal problem than males (62.0% vs. 14.1%, p = 0.72). Sickness absence was higher among participants with an employment period of '≤6 years' than those who have worked for '>6 years' (57.1% vs. 18.6%, p = 1.00). Absence was higher among workers ≤33 years (40.1%) compared to workers ≥34 years (34.8%, p = 0.72). Only 44.1% of the participants who were 'married/living together' reported absence from work compared to 32.4% of the 'other' participants (p = 0.33). There was a small difference in absence percentage for the participants working in the 'doctors room/suite' as opposed to those working in 'other' departments/sections (39.4% vs. 36.6%, p = 0.17). Similarly, the percentage of reported absence from work due to MSDs of participants in the 'matric or less' and 'diploma and above' qualification categories were 35.7% and 41.4%, respectively (p = 0.48).

In terms of the number of sick leave days and intervals taken, the frequency of taking 1–2 days sick leave was higher than more than 2 days for all variables (see Table 3). Although there was no statistically significant association between participants' socio-demographic characteristics and the number of sick leave days taken, a pattern among female office workers who reported a slightly higher frequency of taking sick leave of between '1–2 days' was noted in comparison to male participants (49.0% vs. 15.7%, p = 0.46).

Participants of 33 years and over more often reported taking '1–2 days' sick leave as compared to those under 33 years old (42.2% vs. 34.4%, p = 0.62). Those who were married or living together reported a higher frequency of taking '1–2 days' sick leave than those who are not married or living together (38.8% vs. 24.5%, p = 0.69). There was no clear pattern of sick leave days taken in relation to departments or sections in which participants were employed (doctors' room/suite = 31.4% vs. other = 33.3%, p = 0.39). Participants who had worked for less than 6 years, reported a higher '1–2 days' sick leave than those with more than

"... there was a 76.1% prevalence of MSDs."

Table 2. Association between selected socio-demographic characteristics and absenteeism due to MDSs

	Absent from work						
	Yes		No				
Characteristic	**n**	**%**	**n**	**%**	χ^2	**Df.**	**p-value[a]**
Gender							0.72[a]
Male	10	14.1	2	2.8			
Female	44	62.0	15	21.1			
Total	**54**	**76.1**	**17**	**23.9**			
Age*					0.128	1	0.72
≤ 33 yrs	28	40.6	10	14.5			
≥ 34 yrs	24	34.8	7	10.1			
Total	**52**	**75.4**	**17**	**24.6**			
Marital status*					0.959	1	0.33
Married/living together	30	44.1	7	10.3			
Other	22	32.4	9	13.2			
Total	**52**	**76.5**	**16**	**23.5**			
Department					1.845	1	0.17
Doctor's room/suite	28	39.4	12	16.9			
Other	26	36.6	5	7.0			
Total	**54**	**76.0**	**17**	**23.9**			
Period of employment*							1.00[a]
≤ 6.00 yrs	40	57.1	13	18.6			
> 6.00 yrs	13	18.6	4	5.7			
Total	**53**	**75.7**	**17**	**24.3**			
Education/qualification*					0.490	1	0.48
Matric or less	25	35.7	9	12.9			
Diploma and above	29	41.4	7	10.0			
Total	**54**	**77.1**	**16**	**22.9**			

[a] Fisher's Exact test

* Data missing therefore N is less than 71

6 years of working experience as office workers (54.0% vs. 12.0%, p = 0.48). Finally, participants whose qualification was a 'diploma and above' were more likely to report '1–2 days' sick leave than participants in the 'matric or less' category (37.3% vs. 27.5%, p = 0.60).

Musculoskeletal demands

Significant associations between exposures to certain repetitive administrative work related to musculoskeletal demands and MSDs were identified (see Table 4). Most carried out manual tasks requiring frequent, repetitive motions (80.3%, p = 0.001) and tasks requiring frequent bending of neck, shoulder, elbow, and wrist or finger joints (85.9%, p = 0.005). It was also common for participants to make forceful, quick, or sudden movements (66.2%, p = 0.003), engage in work that involved whole-hand grasping with straight elbows (63.4%), and assume a posture that involves sustained muscle contraction of any limb for periods of more than 30 minutes (59.2%). Quite a few (21.1%) of the participants were required to stand continuously for periods of more than 30 minutes.

Computer usage

Computer usage is presented in Table 5. Two participants did not provide data on this aspect, therefore the results are given for 69 participants. Over two thirds (73.2%) used a computer for at least '2–4 hours per day'. For 46.5% of the participants, their tasks included working continuously without a break for '30–60 minutes'.

Only one participant reported working continuously for more than 2 hours. A similar trend was observed with regard to cycle time. Over 50% exerted minimal force in their work, while in 31% of them, force was not applicable. For the majority (90.1%), the speed of performing a task involved 'fast highly repetitive movements' and their posture was close to neutral (88.7%).

Chi-square analysis of repetitive tasks and MSDs showed a strong association between the frequent use of a computer or keyboard including tasks involving repetitive movements and MSDs (χ^2 = 40.967; p<0.001) and other administrative tasks involving upper extremities (χ^2 = 14.743; p = 0.005). A significant relationship between participants' performance of forceful repetitive tasks and MSDs (χ^2 = 16.964; p = 0.003) was found, but not between prolonged standing and MSDs (χ^2 = 0.447; p = 0.01).

Discussion

The majority of participants had at one point in time reported being absent from work due to backache or other musculoskeletal related problems, and the prevalence was 76.1%. A similar United Kingdom study reported low back pain among office workers as the largest single cause of absence from work, as it was responsible for about 12.5% of all sick days.[10] This was comparable to data from Sweden since 1961, where 11 to 19% of all annual sickness absence days were taken by office employees with a diagnosis of back pain.[10,11] South African statistics on reported backache among office employees in various sectors were found to be limited.[12]

Table 3. Association between the participants' characteristics and number of sick leave days due to MSDs

	Sick leave days						
	1 – 2 days		> 2 days				
Characteristic	**n**	**%**	**n**	**%**	χ^2	**Df.**	**p-value**
Gender							0.46[a]
Male	8	15.7	2	3.9			
Female	25	49.0	16	31.4			
Total	**33**	**64.7**	**18**	**35.3**			
Age					0.250	1	0.62
≤ 33 yrs	19	38.8	8	16.3			
≥ 34 yrs	14	28.6	8	16.3			
Total	**33**	**67.4**	**16**	**32.6**			
Marital status					0.155	1	0.69
Married/living together	19	38.8	10	20.4			
Other	12	24.5	8	16.3			
Total	**31**	**63.3**	**18**	**36.7**			
Department					0.745	1	0.39
Doctor's room/suite	16	31.4	11	21.6			
Other	17	33.3	7	13.7			
Total	**33**	**64.7**	**18**	**35.3**			
Period of employment							0.48[a]
≤ 6.00 yrs	27	54.0	12	24.0			
6.01+ yrs	6	12.0	5	10.0			
Total	**33**	**66.0**	**17**	**34.0**			
Education/qualification					0.270	1	0.60
Matric or less	14	27.5	9	17.6			
Diploma and above	19	37.3	9	17.6			
Total	**33**	**64.8**	**18**	**35.2**			

[a] Fisher's Exact test

Table 4. Musculoskeletal demands

Question	N	p-value[a]	Yes (%)	No (%)
Do manual tasks require frequent, repetitive motions?	68	0.001	80.3	15.5
Does your work posture require frequent bending of neck, shoulder, elbow, wrist or finger joints?	71	0.005	85.9	14.1
Do you have to kneel (on one or both knees) frequently or sometimes?	70	0.60	54.9	43.7
Are you unable to change body position often?	70	0.39	45.1	53.5
Are you involved in any forceful, quick, or sudden movements frequently?	71	0.003	66.2	33.8
Do you engage in the work that involves whole-hand grasping with straight elbows?	70	0.48	63.4	35.2
Does the job posture involve sustained muscle contraction of any limb for periods of more than 30 minutes?	70	0.72	59.2	39.4
Do you stand continuously for periods of more than 30 minutes?	71	0.1	21.1	78.9

[a] Fisher's Exact test

". . . the back was the most commonly affected region as opposed to the neck, shoulder and wrists . . ."

Table 5. Computer usage

Characteristic	N	%
Total time		
2 – 4 hrs/day	52	73.2
4 – 8 hrs/day	17	23.9
Total	**69**	**100.00**
Continuous performance		
10 – 30 min	26	37.7
30 – 60 min	33	47.8
1 – 2 hrs	9	13.0
> 2 hrs	1	1.5
Total	**69**	**100.0**
Cycle time		
10 – 30 min	29	42.0
30 – 60 min	35	50.7
1 – 2 hrs	5	7.2
> 2 hrs	0	0.0
Total	**69**	**100.0**

Characteristic	N	%
Force		
Minimal	41	59.4
Moderate	6	8.7
Not applicable	22	31.9
Total	**69**	**100.0**
Speed		
Fast movements	64	92.8
Moderately paced	4	5.8
Static posture	1	1.5
Slow movement	0	0.0
Total	**69**	**100.0**
Awkwardness		
All postures close to neutral	63	91.3
Moderate deviations in one direction	1	1.5
Near end range in more than one direction	5	7.2
Total	**69**	**100.0**

No statistically significant association between participants' reporting absence from work due to backache and other MSDs, with regard to gender, age, marital status, period of employment and education was found. However, a higher proportion of female than male participants reported MSDs, similar to findings of other studies. Female office workers in Taiwan and Thailand were more likely to report musculoskeletal symptoms than their male counterparts ($p < 0.05$),[4,6] females take more sick leave than their male counterparts,[6,9] and the incidence of MSDs was higher for women than for men (6.5 and 5.7 per 1000 person-years respectively, $p < 0.01$).[13]

A higher proportion of sickness absence due to back pain and other forms of MSDs among participants with less than six years of employment and under 33 years of age. However, when the length of sick leave in relation to age was considered, older workers took more time off (36.4% of those ≥34 yrs compared to 29.6% for those ≤33 yrs). This concurs with other studies which have found that sick leave for MSDs of the upper limbs increased with age.[9,13] In this study most participants were females and they are more vulnerable to musculoskeletal changes that occur with age.[14]

The back was the most affected region compared to other body regions like the neck, wrists and shoulders, unlike other studies which found the converse.[3] However, a large proportion of them (28.2%) reported that their neck, shoulder and wrists were the most affected body regions. The most significant finding among studies on office workers has been the relationship between MSDs and computer usage.[10,11,15] Among the MSDs in computer users, tension neck syndrome[16] and symptoms in the hand and wrist area were commonly found.[13] The risk estimates were in general stronger for the hand/arm region than for the neck/shoulder region, and stronger for mouse use than for total computer use and keyboard use.[4] Similarly, musculoskeletal symptoms have been found to be more prevalent for the arm or hand operating the mouse than for the other hand or arm or any other body region.[5] This might be because computer usage involves typing which creates an increased load on the hands and fingers.[6] Therefore, although the

nature of administrative work is not too physically demanding, invariant tasks such as typing coupled with repetition could result in increased physiological and psychological stress with subsequent risk for musculoskeletal symptoms. In support of this, systematic reviews have shown a positive association between the duration of computer use and hand/arm symptoms.[10,17,18] In this study, over two thirds of the participants reported using a computer for at least '2–4 hours per day', which could explain the high proportion of them reporting their neck, shoulder and wrists as the most commonly affected body regions.

Significant associations between the physical work demands of these office workers and the MDSs were found. These involved associations between repetitive motions of upper limbs, and wrist extension when using the keyboard and forceful movements, echoing the findings of other studies. Association between the multiple (awkward) work postures and tasks performed by office workers, involving neck and upper back flexion while using the computer and supporting the receiver of the telephone with the shoulder, and the development of repetitive strain injuries, cumulative trauma disorders and pain and discomfort in numerous body parts have been demonstrated.[5,11,13,19,20,21]

This study focused on office workers, mainly the receptionists and their supervisors, who belonged to one healthcare organisation. It did not investigate the prevalence of MSDs in other employees involved in similar kinds of tasks, nor did it investigate the role of psychosocial factors in these MSDs. Observations and physical assessments were not done due to resource constraints, which may have compromised the accuracy of the information gathered via self report. Accuracy of recall could also have affected the findings.

Lessons learned

1. Backache is common among computer workers due to the nature of their work which involves continuous repetitive movements.
2. MSDs can increase worker absenteeism with adverse impairment on productivity.
3. Factors such as gender, age, frequency and duration of doing computer work are risk factors for MSDs.
4. Monitoring the magnitude and pattern of MSDs among office workers is crucial for the implementation of effective occupational health programmes to prevent the occurrence of MSDs among these workers.

Conclusions and recommendations

Self-reported musculoskeletal problems were prevalent among office workers in this setting with the most commonly affected regions being the back followed by the neck, wrists and shoulders. Furthermore, the prevalence of MSDS was associated with the physical work demands of the work. The implementation of ergonomically sound interventions in the workplace has the potential of reducing backache and other related MSDs. Therefore, office-specific ergonomic programmes should be considered as a method of choice to prevent the occurrence of work-related musculoskeletal problems among office workers at this healthcare industry. Onsite curative and ongoing support services using a multidisciplinary approach should be provided for affected employees in order to reduce absenteeism from ill-health caused by work-related factors. Further research on this problem is needed. Specifically, studies to examine the effectiveness of interventions to prevent MSDs in this setting.

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SAIOH President's page

Dear Collegues,

It was with deep shock that we learnt of the unexpected passing of our colleague Conrad Bosch. Conrad was a member of the SAIOH Council and SAIOH Certification Board. It is a loss to the profession. Our sincere condolences go to his family and friends affected by the tragic event.

The National Council held a meeting on the 7th of August 2009 where a number of matters were discussed. Seventeen (17) council members attended this meeting. Herewith a summary of matters that were discussed:

• Constitution

The reviewed Constitution will be circulated to Council members for comment. After completion an e-mail referendum will be held and, if approved by the members, it will be applied. The result of the e-mail referendum will be tabled at the next Annual General Meeting in March 2010 for final adoption.

• Continued Professional Development

The system is under review and an item on the Agenda of the Certification Board.

• Code of Conduct, Ethics and Discipline

The consolidation of the document is still in progress. When complete it will be circulated to Council members for comments and finalisation.

• Certification Board and Professional Registration

All questions are in the process of revision to ensure clarity It was noted that the standard of examinations should be uniform all over the country. It was decided that an annual workshop should be held by the Certification Board to discuss the examination procedure.

• Guideline for branches

This document should be finalised and approved at the next Council meeting in November 2009.

• Corporate membership

The draft document is still to be finalised.

• Branch activities

The SAIOH branches are still active. The Central branch has been renamed the Gauteng branch. It held a meeting on the 27th of July 2009, at which a new committee was elected and the topic of nano technology was presented. The KZN branch held a meeting on the 6th of August 2009 with occupational noise as a topic. The Mpumalanga branch is planning an AGM combined with a year-end function on the 30th of October 2009. The Northern Cape & Free State branch, has been renamed the Central branch. Attendance was still a problem due to economic implications for members that have to travel long distances. The venue for meetings might have to move closer to the mining area (Northern Cape).

• Publications

Cas Badenhorst is the driver for publications. *Occupational Health Southern Africa*: A target of at least one article per issue has been set. *National Safety Journal:* Surplus articles and branch news can be published in this journal.

Members are encouraged to produce and submit articles to support these publications. Kindly contact Cas Badenhorst for more details (casb@angloplat.com).

• Website

The website (www.saioh.co.za) is active. Members are again encouraged to use the website and communicate any ideas, inputs or complaints to Kobus Davel who is the SAIOH website watchdog. Kobus can be contacted at kobus@occuserv.com.

• Conferences and seminars

The next SAFECONEX conference is scheduled to be held on 17–18 March 2010 at the Indaba Hotel, Fourways. The theme for 2010: Working together as one team in 2010. It was decided to improve on the technical content of presentations. A first call for papers has already been circulated. An abstract of no longer than 250 words can be submitted by not later than 30th November 2009 to Kevin Renton (kevin.renton@nioh.nhls.co.za) or contact Kevin on +27 (0)11 712 6479. Poster presentations will also be included. SAIOH members are encouraged to participate in this conference. A banquet is also planned for the evening of the 17th of March 2010 to recognise people in the profession.

• IOHA accredited courses

The first IOHA courses offered by SAIOH under licence will be launched in February 2010.

Success and failure are the same choice; only attitude determines the difference. *Ross A. Halliday*

Motivation is an external, temporary high that PUSHES you forward. Inspiration is a sustainable internal glow which PULLS you forward. *Thomas Leonard*

Let us keep on focusing on success on improving working environments.

Melinda Venter, SAIOH President

E-mail: melindav@lantic.net

Mine Medical Professionals' Association
Twelfth Annual Congress

The Twelfth Annual Congress will have taken place at Gleburn Lodge by the time that readers receive this issue of the journal. There are currently numerous issues facing the mining medical professional which we hope to highlight and stimulate discussion and dialogue on, at the congress. TB, HIV and silicosis remain the top health priorities in the mining industry, in addition to industry efforts to meet the MHSC's Dust, Noise and Fall of Ground milestones by 2013, Amendments to the MHSA have serious implications for how we do our work in occupational health settings within the context of a strained economy, pending National Health Insurance, a sunset industry and an ageing workforce. All in all these topics, presented by the experts in the field, bode well for a very exciting conference packed with cutting edge knowledge, DVDs during the breaks and clinical quiz time! The draft programme, at the time of going to press, is shown below. Feedback on the event will be given in the next issue.

Friday, 2 October 2009

12h00 – 12h30	**REGISTRATION, TEA, COFFEE AND SANDWICHES**
	Showing of DVD 1 and 2: It's everyone's problem, and Uthuli – SIM 03 06 03: Silicosis elimination awareness for persons affected by mining operations in South Africa.
12h30 – 12h40	*Dr Vanessa Govender, President:* Official welcome.
12h40 – 13h15	*Warren Beech, CEO Leppin Beech:* MHSA amendments and implications for mine medical professionals.
13h15 – 13h45	*Roger Baxter – Chief Economist, Chamber of Mines:* Impact of the global economic crisis on the mining sector – and the green shoots of recovery.
13h45 – 14h15	*Dr Deodat Kritzinger, Rand Mutual Assurance:* RMA Overview and claims profile.
14h15 – 14h45	*Dr Audrey Banyini, MHSC and Dr Deodat Kritzinger, RMA:* The audio repository feedback for medical surveillance: Value add or waste?
14h45 – 15h15	**TEA BREAK**
	Showing of DVD 3: Reflections – SIM 03 06 03: Silicosis elimination awareness for persons affected by mining operations in South Africa.
15h15 – 16h45	*Dr Thuthula Balfour, Kaipa:* Health priorities in the mining industry/TBK/NHI/ex-mine worker, TB silicosis.
16h45 – 16h15	*Gill Nelson, NIOH:* Three decades of silicosis in the SA gold mining industry.
16h15 – 17h45	*Gavin Churchyard, Aurum Institute:* Going for gold: controlling TB in silica exposed workers/ HIV.
17h45 – 17h15	*Zodwa Ndlovu, NIOH:* Silicosis then and now – development of awareness raising materials.
17h15 – 18h00	*Alex Sinclair, National Sales Manager, Spiderwebb Altitude Systems:* A word from a sponsor.
18h30	**DINNER**

Saturday 3 October 2009

07h30 – 08h30	**BREAKFAST**
08h30 – 09h00	*Tia-Mari Hofmann:* The assessment of work capacity: a practical approach to managing physical fatigue.
09h00 – 09h30	*Prof. Mary Ross:* Pandemic flu. ICOH feedback.
09h30 – 10h00	DME or MBOD digital radiology – unconfirmed.
10h00 – 10h30	**TEA BREAK**
	X-ray viewing
10h30 – 11h00	To be confirmed.
11h00 – 11h30	*Don Emby:* Don't die by mistake.
11h30 – 12h00	*Mr Henry Moorcroft:* Linking medical surveillance and hygiene.
12h00 – 12h30	*Dr M R Hansia:* Noise-induced hearing loss.
12h30 – 13h00	*Professor Jan Verschoor:* The future of TB diagnostics – To be confirmed.
13h00– 14h00	**LUNCH**
	X-ray viewing and Track C – DVDs.
14h00 – 15h00	*Dr Jim Murphy:* Ethics.
15h00 – 15h30	*Dr Charles Mbekeni:* Clinical governance in occupational health.
15h30 – 16h00	*Professor Davies, NIOH (Past Director):* Evidence-based medicine has been around for around about fifty years: Time for a review of mine-related research.
16h00- 16h30	**TEA BREAK**
16h30 – 17h00	*Dr Vanessa Govender (President):* Mosh adoption perspectives.
17h00 – 17h30	*Dr Murray Coombs:* Manganism, the ongoing saga.
17h30 – 18h00	*Don Emby:* Is silicosis treatable? Answers to quiz.
18h00 – 18h30	*Dr DB De Villiers (Past President):* CLOSURE OF CONGRESS.
18h30	**DINNER**

Sunday, 4 October 2009

Breakfast and check out.

Vanessa Govender, President

SASOHN Pretoria – News

Workshop 5 August 2009

The SASOHN Pretoria branch's workshop is conducted, based on the needs expressed by the members. With the SASOHN Executive objective of "back to basics" in mind we arranged a workshop covering the various aspects of TB.

We were fortunate to confirm speakers as well as exhibitors to fit in with the theme, with SANTA, Imbizo Health, Ampath, and SSEMmtembu in attendance. All aspects of TB were covered. It commenced with a case study by an occupational hygienist (AIA) highlighting the importance of air quality index monitoring in the prevention of respiratory infections, especially where overcrowding occurs – the 20:80 Pareto principle applies in most facilities where you have a centrally controlled air conditioner, with only 20% of new air being circulated. The control measures include adequate cross ventilation and compliance with design specifications for the facility.

The international OEL (Danish standard 100FCU/m^3) for bio-aerosols is used to monitor and assess the concentration of airflow/m^3 in office accommodation, due to lack of OEL available in South Africa. The use of ultraviolet irradiation also came under discussion with research currently underway, on the possible ill-health effects it may pose. At this stage the results have been inconclusive.

Dr Sally Buckton gave a presentation on the link between the military, HIV, and TB and the ethical dilemma and human rights challenges it poses for employers like the military. It is required that "healthy" soldiers be deployed as peace-keeping forces outside the borders of SA. However, as the statistics clearly showed sub-Saharan Africa is most at risk with the biggest concentration of TB and HIV infections reported, deployment in this region is a risk to the military.

Dr Spo, from the NIOH, provided valuable information on the link between the laboratory test, the OHNP and diagnosis of TB. Questions on the different results from cultures/BACTEC test provided for a lively interaction.

Prof. Davies from the NIOH provided us with data analysis and statistics in terms of his topic "why TB cannot be controlled." He believes that the progression of the disease depends on the strain of MTB, prior exposure, vaccination, infectious dose, and immune status of the host. The OHNP is to ensure that the sputum of all old TB clients is negative, must be able to identify an abnormal chest X-ray and needs to know if the client is immuno-compromised.

Dr Hermien van der Merwe talked to us about how to use "wellness" in the fight against chronic diseases and TB. She indicated that all clients go through the process of denial, anger, bargaining, depression, and acceptance. The OHNP needs to be sensitive to the psychological needs of the client with chronic disease, as they are actually stressed, and are in need of a period of adjustment to go through the process of dealing with the disease. Stigma and fear, as well as ignorance, affect both individual and co workers.

Dr Mpo Moloi (DoH) re-visited the DOTS programme and also covered the management of MDR TB. She indicated that 50% of extra-pulmonary TB clients were also HIV positive. A concern is that the TB meningitis mortality rate is rising and known control measures, like the use of BCG, is not effective. A new guideline (2008) on the treatment of TB is available from the DoH.

The workshop provided us with an opportunity for active interaction, questions and debate on how to prevent the disease that threatens our lives.

Louwna Pretorius – SASOHN Pretoria

Community Service Project

In February 2009, at the first meeting of the year, SASOHN Pretoria resolved to initiate a community project. Fortunately the SASOHN Pretoria members were very enthusiastic and immediately took up the challenge and it was decided that we would collect soup to donate to an organisation for the underprivileged. Each member brought a packet of soup to every subsequent meeting and exhibitors at monthly meetings also made donations towards the project. In June, when all the collections were counted there was enough soup to assist two projects.

As the chairperson of the regional branch, I had the privilege of handing over two shopping bags filled with soup packets, as well as a R100 donation, to the 'Jacaranda Kinder Huis' in Eastlynn Pretoria. It was a wonderful day. I felt immense joy and pride when seeing the children's faces light up as I presented the donations.

We are all immensely privileged to have a home and food on the table, and sometimes we take it for granted. Being involved in such initiatives allows us to appreciate what we have. I wish to pay tribute to all the members, who generously responded to the call, thereby giving something back to the community.

Kim Davies

Chairperson, SASOHN Pretoria

Post ICOH2009 vitality

An 'All Africa group'

A group of delegates from many countries in Africa met during the 29th International Commission of Occupational Health Congress (ICOH2009) in Cape Town in March this year and expressed an interest in reviving an African Occupational Health network system.

The South African Society on Occupational Medicine (SASOM) together with the University of Limpopo has taken up the challenge to revive the communication between those working in the occupational health field on the African continent and adjacent countries, and are acting as the initial facilitators.

The Pan African Congress on Occupational Health (PACOH) and the African Association of Regional Occupational Health (AAROH) are existing organisations and we would like to coordinate the circulation of all available information, including previous policies, to be able to draw up a preliminary constitution and plan for further action involving all interested parties.

The benefit will be the creation of one communication network for all.

Our readers are invited to send information, contact names and comments to the e-mail address: info@sasom.org and to spread the word to those who may not be aware of this initiative.

SASOM Guidelines

The revision of the SASOM guidelines is nearing completion and will be available singly and in the Ramazzini set of 24 practical guides in November 2009. Contact the SASOM National Office.

SASOM website

Visit the new website for information, news, events, positions available or wanted, committees, lecture notes and much more at www.sasom.org

SASOM Conferences and Ramazzini meetings

The next SASOM Conference takes place on 23 and 24 October 2009 at the Lesedi Cultural Village in Broederstroom. The SASOM National Office will be presenting three conferences in different parts of South Africa next year while the Chapters will arrange Continuing Educational meetings several times a year as in the past.

SASOM National Office

While SASOM has operated from a spacious new office for the past year, we did not change our contact details to avoid confusion with ICOH2009 in the offing. We now wish to announce our new website address: www.sasom.org, e-mail address – info@sasom.org, postal address: PO Box 32, Silverton, 0127, and our physical address – First Floor, Argo Building, 184 Erasmus Street, Meyerspark, Pretoria, 0184.

The National Office telephone numbers are: +27 (0)12 803 7418 and 086 111 4417.

The fax lines are: +27 (0)12 803 7418 and +27 (0)11 507 5085.

For more information do not hesitate to contact Jenny Acutt in the National Office.

SASOM Congress reminder

SASOM's annual one-day congress, together with the national AGM and the AGM of the Inland Chapter, takes place on the weekend of 23 to 24 October. This is also an opportunity for a breakaway weekend with members and their families. The cost is R150.00 per member and per member's spouse or children per day, and R250.00 per non-member and per non-member's spouse or children, per day. It starts with Friday lunch, congress, dinner, bed and breakfast and again from Saturday lunch till Sunday breakfast, including all teas and cultural events.

Upcoming events

INTERNATIONAL CONFERENCES

Date	Place	Topic	More information
5–8 November 2009	San Juan, Puerto Rico	8th International Conference on Occupational Stress and Health: Work, Stress, and Health 2009: Global Concerns and Approaches	http://www.acoem.org
10–12 February 2010	Helsinki, Finland	Finnish Institute of Occupational Health: International Conference, Towards Better Work and Well-being	
21–25 April 2010	Taipai, Taiwan	Medichem – Occupational health under globalization and new technology	E-mail: epicohmedichem2010@gmail.com
14–17 June 2010	Amsterdam, The Netherlands	The changing world of work – 4th International Conference on Psychosocial Factors at Work	E-mail: paog@vumc.nl
6–9 August 2010	Yokohama, Japan	ICOHN & ACOHN Joint Conference 2010 Global challenges to Occupational Health Nursing	http://icohn-acohn2010.com E-mail: secretariat@icohn-acohn2010.com

LOCAL CONFERENCES

Date	Topic	Region	Target	Cost	ContactName
23, 24 Oct 2009	SASOM Annual Conference and AGM	Lesedi Cultural Village, Broederstroom	OH&S professionals	Members R150.00/ day. Non members R250.00/day	Jenny Acutt Tel: +27 (0)12 803 7418 E-mail: info@sasom.org
28, 29 Oct 2009	SHERCON Intl. OSHE & Risk Management Conference & Exhibition	Grand West Casino, Cape Town	OH&S professionals	R1950.00	Henk Van Der Westhuizen Tel:+27 (0)12 663 9413 www.dekra.co.za
29, 30 Oct 2009	Institute of Safety Management: 2009 H&S Conf. and Exhib.	Durban	OH&S professionals	R975.00	Elishya Abbu Tel: +27 (0)31 2667070 E-mail: elishya@masterbuilders.co.za
29 Oct, 2, 3 Nov 2009	ESSA workshops: Managing stress and fatigue at work: an ergonomic approach	Grahamstown, Johannesburg, Cape Town	OH&S professionals	R750.00	http://www.ergonomicssa.com
4–6 Nov 2009	SASOHN Annual Conference: Conducting the Occupational Orchestra	Boardwalk Casino, Port Elizabeth	OH&S professionals	Conference and events – R2100.00. Conference, day only – R1850.00.	Linda Stokes SASOHN National office Tel: +27 (0)11 892 3174 Daily from 08h00–14h00 E-mail:sasohnoffice@mweb.co.za
5, 6 Nov 2009	11th Conference of ESSA: Ergonomics: Challenges of a world in change.	Protea Hotel Marine, Port Elizabeth	OH&S professionals	Various – please contact organisers.	Candice Christie Tel: +27 (0)46-603 8470, E-mail: c.christie@ru.ac.za http://www.ergonomicssa.com
18 Nov 2009	Webster Memorial Seminar 2009. Occupational health nursing: Back to the future	National Institute for Occupational Health, Johannesburg	OH&S professionals	To be advised.	Shanaz Shapurjee Tel: +27 (0)11 712 6518 E-mail: shanaz.shapurjee@nioh.nhls.ac.za
17, 18 Mar 2010	SAFECONEX Africa 2010	Indaba Hotel and Conference Centre Fourways	OH&S professionals	Early bird registration before 31 Dec. 2009 – R3500.00, thereafter R3800.00	Conference: info@raysaf.co.za Exhibition: delinds@mweb.co.za

2009 SAIOH COUNCIL AND CERTIFICATION BOARD MEETING AND EXAMINATION DATES

6 November	07h00	Council/Written Exams
4 December	07h00	Cert. Board/Oral Exams

HEALTH AWARENESS DAYS, WEEKS AND MONTHS

NOVEMBER

Red Ribbon Month
Quality Month

Day	Topic
1	Africa Youth Day
7	National Children's Day
2–7	SADC Malaria Week
13	SADC Malaria Day
14	World Diabetes Day
25	International Day for The Elimination of Violence Against Women
25/11 – 10/12	16 Days of Activism on No Violence Against Women

DECEMBER

Mental Health Awareness Month

Day	Topic
1	World AIDS Day
3	International Day of Disabled Persons
9	World Patient Safety Day

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