



**NATIONAL INSTITUTE FOR
OCCUPATIONAL HEALTH**

Division of the National Health Laboratory Service

NIOH Research Day Abstract Book

**Biennial Research Day
30 November 2022**

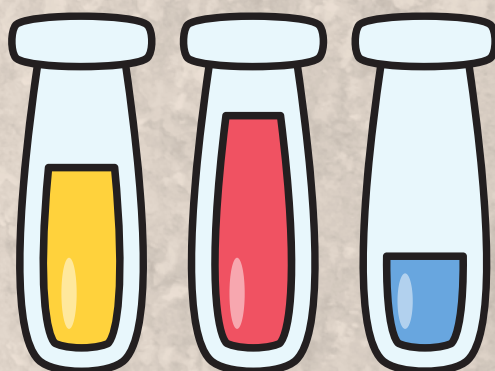
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FOREWORD

Welcome to the National Institute for Occupational Health (NIOH) biennial Research Day, via the Zoom platform. This event is an opportunity for NIOH researchers to present in their current research, share in new knowledge and engage with industry stakeholders, with the intent ultimately to improve and promote workers' health. This is the second time this event will be held online. The event is opened by the Executive Director of the NIOH, Dr Spo Kgalamono, followed by presentations from two keynote speakers. The first plenary speaker is Prof Koleka Mlisana, who currently serves as the Executive Manager: Academic Affairs, Research & Quality Assurance at the NHLS. The second speaker is Prof Rajen Naidoo, who is the HOD of Occupational and Environmental Health, UKZN. Both their biographical sketches are available herein. Contributions from NIOH staff and students are included, with both oral and poster presentations, giving presenters an opportunity to showcase their work and then answer questions posed by participants. The biographical sketches as well as the abstracts for the NIOH presentations are supplied below. The day is concluded with closing comments from the NIOH Research Committee Chairperson, Dr Natasha Sanabria, and acknowledgments for all who worked collectively to make the event a success. We trust that all find the event to be informative, engaging and conducive to future research endeavours.



Research Day Programme

08h30-08h50	REGISTRATION	
08h50-09h00	Welcome & General Housekeeping (Questions in Q&A window; link to webinar content)	Mr Ashraf Ryklief, National OHS Training Manager, NIOH
09h00-09h10	Introduction & Overview	Dr Spo Kgalamono, ED, NIOH
PLENARY TALKS (Chair: Mr Ryklief)		
09h10-09h30	Research Overview and Support in the NHLS	Prof Koleka Mlisana, Executive Manager: Academic Affairs, Research & Quality Assurance, NHLS
09h30-10h00	Health Surveillance and Health Information Systems: Using data to protect the health of workers	Prof Rajen Naidoo, HOD of Occupational and Environmental Health, UKZN
ORAL PRESENTATIONS (Chair: Dr B Kgarebe)		
10h00-10h15	HIV Knowledge, Attitudes and Practices in agricultural workers	Nosimilo Mlangeni, HIV & TB, NIOH
10h15-10h30	The demographics and histopathology of Basal Cell Carcinoma in the Limpopo Province of South Africa: a case series	Radzilani Manenzhe, Pathology, NIOH
10h30-10h45	Reliability, validity and dimensionality of GHQ-12 in Health Care Workers during the COVID-19 pandemic: Structural equation modelling	Dr Clement Nyuyki, Epidemiology & Surveillance, NIOH
10h45-11h00	Occupational Cardio-respiratory diseases in South African miners at autopsy: The First Pathology Surveillance Report within the COVID era	Lucia N Mhlongo, Pathology, NIOH
11h00-11h15	Spectrophotometric method development & validation for applied occupational exposure assessment: Trichloroethylene	Lerato Monatisa, Analytical Services, NIOH
11h15-11h30	Factors affecting Pulmonary Tuberculosis (PTB) treatment outcomes in Mamelodi	Dr Wells Utembe, Toxicology & Biochemistry, NIOH
11h30-11h45	Factors associated with COVID-19 vaccine uptake among hospital admitted health workers in South Africa: 2020 to 2022 (preliminary analysis).	Jonathan Ramodike, Epidemiology & Surveillance, NIOH
11h45-12h00	COMFORT / BIO-BREAK	



Research Day Programme

DIGITAL (FLASH) POSTER PRESENTATIONS (Chair: Dr N Tlotleng)		
12h00-12h05	Preliminary findings on the presence of respiratory & enteric pathogens in wastewater	Evida Poopedi, Immunology & Microbiology, NIOH
12h05-12h10	Validation of a method for the routine determination of Zinc in urine by Inductively Coupled Plasma Mass Spectrometry	Angela Mawela, Poobalan Poongavanum, Analytical Services, NIOH
12h10-12h15	Qualitative & quantitative characterisation of arsenic-binding peptides by LC-ESI-MS for the development of POC device for SA mines	Refilwe Moepya, Analytical Services, NIOH
12h15-12h20	Impact of COVID-19 lockdown restrictions on suspected suicide prevalence at the JHB Forensic Pathology Services Medico-legal mortuary	Sabine Kirchner, Analytical Services, NIOH
12h20-12h25	How far are we in ending the legacy of Asbestos?	Zethembiso Ngcobo, Pathology, NIOH
12h25-12h30	Exercise increases expression of glucose transport & lipid metabolism genes, 6h post exercise in rat skeletal muscle	Dr Jitcy Joseph, Toxicology & Biochemistry, NIOH
12h30-12h35	Gold nanoparticles (AuNP) uptake and toxicity in representative cells	Millicent Magogotya, Toxicology & Biochemistry, NIOH
12h35-12h40	Comparison of amended OEL-MLs in the Regulations for Hazardous Chemical Agents with International limits	Karen du Preez, Occupational Hygiene, NIOH
12h40-12h55	POSTER PRESENTERS QUESTION & ANSWER SESSION	
12h55-13h00	Closing comments & acknowledgments	Dr Natasha Sanabria, RC Chair, NIOH
13h00-14h00	OCC-HEALTH PRACTITIONER & ADVISOR NETWORK LAUNCH (Chair: Dr N Gomba) *optional session, onsite @ NIOH Information Resource Centre	



Message from the Research Committee Chair: Dr Natasha Sanabria

Occupational health is an integral part of public health, where the poor usually have limited access to occupational health services in South Africa. This affects more than 80% of workers and that of the surrounding communities. It has created a hidden epidemic of Occupational disease, which has recently been made very clear during the global pandemic.

These situations are not isolated and there are many challenges and opportunities for occupational health research in Africa as a continent. The Institute's biennial Research Day is an opportunity to showcase the multidisciplinary work and highlight the research studies conducted by the occupational health practitioners and medical scientists at NIOH.

The aim of this event is not only to present the current research, but also encourage discussion around, and support for, preventive interventions in the workplace. In this way, the NIOH can share new knowledge that can support and provide opportunities to make a positive impact on occupational health and safety, in South Africa and internationally, in order to improve workers' health.

NIOH's research covers a range of study areas, including exposure assessments, workplace interventions and occupational epidemiology spanning both the formal and informal economy and across many sectors and industries. The scope has grown over the years and broadened to include aspects of environmental health, gender concerns and reproductive health, problems related to coal workers, climate change, as well as important policy concerns.

To date, we have approximately 60 research projects listed on the NHLS academic affairs and research management system (AARMS). Most of these projects have been initiated within the last 5 years, and, all contribute towards the publication outputs and student supervision activities.

These studies provide complementary insights to the evidence-base, and its application to practice and policy, as well as an initiating engagement to foster further collaborations. Collectively, the NIOH research projects are testimony to the many Occupational and Environmental Health and Safety (OEHS) issues that require new knowledge.

We are fortunate to have two distinguished keynote speakers share their expertise and experience of key research issues. The first plenary speaker is Prof Koleka Mlisana, who currently serves as the Executive Manager: Academic Affairs, Research & Quality Assurance at the NHLS.

The second speaker is Prof Rajen Naidoo, who is the HOD of Occupational and Environmental Health, UKZN. Their contributions are greatly appreciated because they are in the position to give valuable insight into research that has been conducted in the past, as well as what is current within the field. Knowing where we have come from, within the scope of occupational health research, helps guide where we should go in the future.

The NIOH Research Day national event allows us to emphasise again the importance of collaboration and partnership in innovation, as well as highlight the importance of collaboration and coordination on the continent. We trust that the new knowledge shared will stimulate discussions and provide opportunities for future collaborations in Occupational Health research – ultimately to improve and protect workers' health and safety. It is also important to grow the scope of the institute's research efforts and to strategically increase engagement of younger researchers.

We hope to motivate upcoming scientists, showing them the possibilities in the future. Researchers need to meet the challenge and be "the change" they want to see in South Africa, and in the process, transform lives through the impact of their research. We trust that all find the event to be informative, engaging and conducive to future research endeavours.



Research Committee Chair Bio- sketch



Dr Natasha Sanabria, Head of Toxicology and Biochemistry, NIOH

Dr Sanabria has extensive experience specialising in biochemical investigations and genetic analyses of disease-related states, e.g. gene expression during stressed conditions, "Self/non-self" recognition events, innate immunity, cellular signal perception/transduction, as well as the assessment of nanomaterial toxicity using molecular biology-based techniques. She completed a Biochemistry MSc degree, which was awarded cum laude in 2003 (RAU). She received the NRF Prestigious award, discovered a new gene (GenBank accession number GU196248) and obtained a PhD in 2009 (UJ). Thereafter, she received the NRF Innovation Fellowship to complete Postdoctoral studies in 2011, with training at Cold Spring Harbour Laboratory (New York, USA). Dr Sanabria worked as a lecturer at UJ, the Biochemistry Honours-course Coordinator, as well as the QC manager on an international patent for the Metacatalysis/"Metals in medicine" units. She then moved to the NIOH/NHLS in 2013 as the Toxicogenomics Lab Manager, attended nanoparticle-specific training (Boston, USA) and held an NHLS Research Trust Development Grant (2015-2017). Dr Sanabria also served as the Coordinator for the WHO Exposure Assessment to nanoparticles Workshop (2013), NanOEh conference Organizing Committee Member (2015), higher-degrees co-supervisor, as well as a Mentor for DST/NRF Industry Interns (2015/2016). She has served as a reviewer for international journals, the NHLS Research Trust, National Research Foundation (NRF) and the Water Research Commission (WRC SA).

She has contributed to the WHO guidelines on protecting workers from potential risks of manufactured nanomaterials (2017), based on a report submitted to the WHO (2015), as well as a baseline study submitted to DST (2014). Dr Sanabria then pursued a full-time MSc in Bioinformatics and Computational Molecular Biology in 2017, which was awarded cum laude by Rhodes University, and re-joined NIOH as the Head of Department for Toxicology and Biochemistry in March 2018. She is currently Chair of the Research Committee at NIOH, an advisory board member of the Institute for Nanotechnology and Water Sustainability (iNanoWS), extraordinary lecturer at UP, associate member of American College of Toxicology, and a member of the international NanoSolveIT Consortium for in silico Integrated Approach to Testing and Assessment for the environmental health and safety of Nanomaterials.



Bio-sketches of plenary speakers



Prof Koleka Mlisana, Executive Manager: Academic Affairs, Research & Quality Assurance, NHLS

Professor Koleka Mlisana is the Executive Manager: Academic Affairs, Research & Quality Assurance at the National Health Laboratory Service (NHLS), since July 2018. Prior to this she was the HOD: Medical Microbiology at UKZN/IALCH; also served a term as a member of the NHLS Board; and used to be a member of the Ministerial Advisory Committee on Antimicrobial Resistance. Her work includes previously being an active HIV/AIDS researcher, for over a decade focussing on HIV prevention and pathogenesis, working at the Centre for the AIDS Program of Research in South Africa (CAPRISA), Durban. She has undertaken seminal research which has revealed how the body responds during acute HIV infection. Her current research interests include TB diagnostics, antimicrobial resistance as well as sexually transmitted infections. Prof Mlisana has co-authored more than 190 peer reviewed journal articles. Amongst other national commitments, Prof Mlisana is the current Co-chair of the COVID-19 Ministerial Advisory Committee (MAC), she previously chaired the Pathology/Laboratory subcommittee of the first established MAC for Covid-19; up until very recently she was a member of the Board of Trustees for the South African National AIDS Council (SANAC) as well as the Academy of Science of South Africa (ASSAF), and she is a member of the Medical and Dental Board of the HPCSA/Medical Scientist Committee. She has nurtured and mentored many young scientists and is passionate about equipping the next generation of leaders and scientists.



Bio-sketches of plenary speakers

Prof Rajen Naidoo, HOD of Occupational and Environmental Health, UKZN

Professor Rajen Naidoo, a full Professor and Head of Department in Occupational and Environmental Health at the University of KwaZulu-Natal, has been in academic research for over 25 years. His areas of research focus on occupational and environmental respiratory diseases, with projects funded by major national and international agencies, including the National Research Foundation, US National Institutes of Health and the European Union. He has over 95 peer-reviewed publications, with presentations at several international conferences. He is an Associate Editor of the International Archives of Occupational and Environmental Health and on the Editorial Board of the American Journal of Industrial Medicine and Environmental Epidemiology. He received his postgraduate training in occupational medicine at the University of Cape Town, and his doctorate at the University of Michigan. He serves on the national Occupational Health and Safety COVID-19 Workstream in the National Department of Health, as well as an occupational health and COVID-19 advisor on NEDLAC. He has been involved in the drafting of the various National Department of Health Guidelines for Workplaces, as well as the Department of Employment and Labour Direction on COVID-19.



Oral presenters Bio-sketch & Abstract



Ms Nosimilo Mlangeni, HIV & TB, NIOH

Ms Mlangeni is currently working as a Medical Scientist at the National Institute for Occupational Health. She holds a Master's degree in Public Health, specialized in health systems and policy. The focus of her specialty is translation of research into policy and practice. Her research interests and outputs are in the areas of HIV, TB, workers' health and health equity. Nosimilo has worked in HIV and TB programs at different levels of health systems, with South African Department of Health and international organizations.

Title: HIV Knowledge, Attitudes and Practices in agricultural workers: A precarious and vulnerable workforce in South Africa

N Mlangeni^{1,2}, S Kisting³, J Ramodike^{1,4}, M Malotle¹, Y Sikweyiya^{5,6}, N Sebe⁷, N Stuart-Thompson⁸, C Du Preez⁹, M Zungu^{1,3}

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4 University of Pretoria, School of Health Systems and Public Health, Pretoria, South Africa.

5 Gender & Health Research Unit, South African Medical Research Council, Pretoria, South Africa.

6 School of Public Health, University of the Witwatersrand, Johannesburg, South Africa

7 Centre for Positive Care, Sibasa, South Africa.

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9 Hoedspruit Training Trust (Hlokomela), Hoedspruit, South Africa.

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Abstract:

Introduction

Previous studies have shown that agricultural workers bear a disproportionately higher burden of HIV, which is the highest HIV prevalence ever reported in any working population in South Africa. Adequate knowledge about HIV contributes towards positive HIV attitudes, and promotes safer sexual practices. This study aimed to assess HIV knowledge, attitudes and practices of agricultural workers, as a precarious and vulnerable workforce.

Methods

A cross-sectional study design was employed. A pre-piloted paper-based questionnaire adapted from a previous survey conducted in a similar population was administered to a consenting sample of agricultural workers. A two stage cluster sampling was used to sample farms and participants. Descriptive and inferential statistics were performed using stata version 16.1 software, where 0.05 level was used as a measure of significance.

Results

The majority of agricultural workers had adequate knowledge level (72.1%) regarding HIV/AIDS. Knowledge was significantly associated with having some level of education, including primary (AOR: 1.76, 95% CI: 1.19-2.62), secondary education (AOR: 1.46, 95% CI: 1.01-2.12), and post matric qualification (AOR: 3.07, 95% CI: 1.61-5.83). The attitudes level of workers towards HIV and people living with HIV was good (88.1%). Attitude was negatively associated with residing in informal settlements (AOR: 0.64, 95% CI 0.43-0.97). Majority of participants exhibited poor prevention practices regarding HIV (60.9%). Half of participants reported low condom usage (50.9%) and multiple sexual partners (50.6%). Prevention practices were positively associated with being from Zimbabwe (OR: 1.66, 95% CI 1.34 – 2.06), being in a relationship (OR: 1.91, 95% CI: 1.51-2.42) and being married (OR: 3.34, 95% CI 2.63-4.25).

Conclusion

Agricultural workers exhibited adequate knowledge and good attitude regarding HIV and AIDS. The portrayed risky sexual behaviour establishes agricultural workers as an HIV high-risk population. Strategizing non-conventional approaches to HIV prevention and behaviour change communication targeting agricultural workers is recommended.





Mr Radzilani Manenzhe, Pathology NIOH



Mr Manenzhe is a Prosecutor and a HPCSA registered Biological Medical Scientist Intern at the Pathology division of the NIOH. He holds a Bachelor of Science (BSc) in Microbiology and Biochemistry from the University of Venda, a Bachelor of Health Sciences (BHSc) Anatomical Pathology from the University of the Witwatersrand and he is currently studying towards a Masters in Science (MED) by dissertation in Anatomical Pathology at the University of the Witwatersrand. His research interests lie in the pathology of occupational lung disease, histology techniques used to conduct the research and histopathology of tumors in patients. He has seven years experience in Anatomical Pathology and histology laboratory. He previously worked at Chris Hani Baragwanath Academic Hospital NHLS Anatomical Pathology division, where he qualified as an HPCSA registered medical technician through the SMLTSA board exam.

Title: The demographics and histopathology of Basal Cell Carcinoma in the Limpopo Province of South Africa: a case series

Radzilani Manenzhe^{1,2}, Lucia N Mhlongo¹, Casey McCusker²

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2 School of Pathology, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

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Abstract:

Introduction

The incidence of skin cancer is increasing worldwide. Amongst the most prevailing are non-melanoma skin cancers consisting predominantly of basal cell carcinoma (BCC) and squamous cell carcinoma. Available data indicates basal cell carcinomas occur slightly more often in males; in adults in their sixth decade and rarely in individuals of African origin.

Objectives

The aim of this study was to describe the demographics, and the clinical and pathological findings among patients diagnosed with basal cell carcinoma in a predominantly native African community, in Limpopo, South Africa.

Methods

A retrospective descriptive case series of 86 basal cell carcinoma cases was conducted at the National Institute for Occupational Health (NIOH), Pathology Division. Data for all the cases diagnosed as basal cell carcinoma between 2017-2021 was retrieved from the laboratory information system. Data retrieved was analysed using STATA v.15.

Results and Discussion

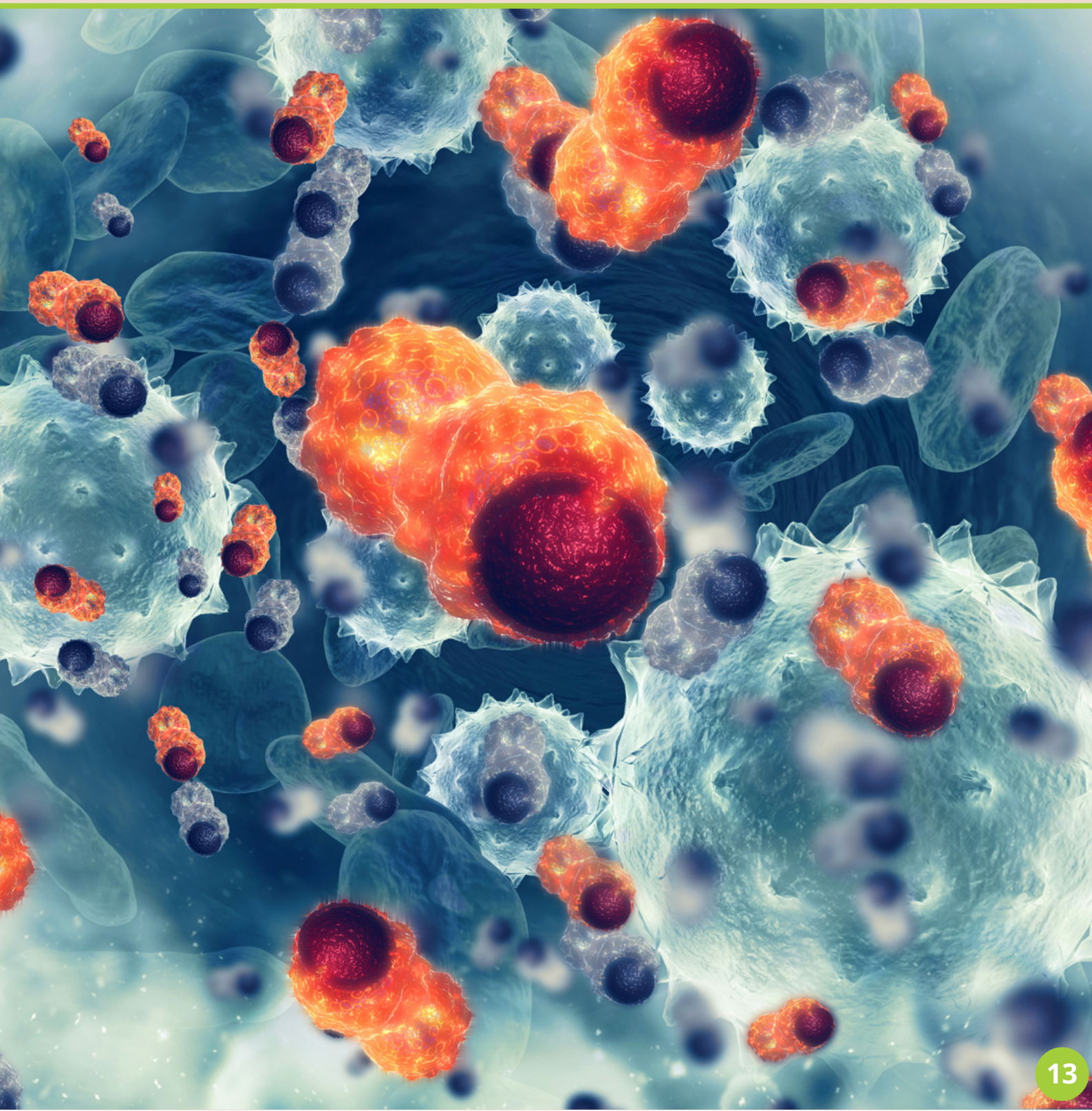
The majority of the cases were diagnosed among females (64.0%) and African population (59.3%), a distinctive finding as other studies normally report opposite findings. The mean age among the 86 cases was 61 years. Most of the lesions 53.5% (n=46) were from the head and neck region.



Similar findings have been reported in other studies and this could possibly be due to the fact that this area of the body is the most sun exposed. The nodular (n=39), Infiltrative (n=6), and basosquamous (n=5) subtypes were the most identified BCC subtypes. Twenty-four cases were diagnosed with more than one subtype, Nodular and Keratotic (n=8, 9.3%) being the most common combination.

Conclusion

The study found a higher incidence of basal cell carcinoma in females than males. The most common histological subtype was nodular.





Dr Clement Nyuyki, Epidemiology & Surveillance, NIOH

Dr Nyuyki is a Biostatistician at the Epidemiology and Surveillance Section of the NIOH. He has a wealth of experience in developing data masks for various study designs using Epi-Info, Epi Data and REDCap. He specialises in data analysis and modelling of epidemiologic studies. He holds an MSc in Biostatistics and Epidemiology and PhD from the University of the Witwatersrand, Johannesburg, South Africa.

Title: Reliability, validity and dimensionality of GHQ-12 in Health Care Workers during the COVID-19 pandemic: Structural equation modelling

Clement Kufe Nyuyki^{1,2}, Colleen Bernstein³, Kerry Wilson^{1,4}

1 Epidemiology and surveillance section, National Institute for Occupational Health, National Health Laboratory Service

2 School of Health Systems and Public Health, University of Pretoria

3 Department of Psychology, University of the Witwatersrand,

4 School of Public Health, University of the Witwatersrand

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Abstract:

Introduction

Health Care Workers (HCWs) are among the high-risk group for SARS-CoV-2 infection and a high burden of mental health including depression, anxiety, traumatic stress, avoidance and burnout. The 12-Item General Health Questionnaire (GHQ-12) has showed best fit in one factor structure and a multidimensional structure for screening of common mental disorders and psychiatric well-being. The aim was to test for the reliability and validity and ascertain the factor order of the GHQ-12 in HCWs during COVID-19 pandemic.

Methods

Data was collected from 832 hospital staff during the COVID-19 pandemic in South Africa. The factor structure was examined by exploratory factor analysis (EFA) and structural equation modelling (SEM) for confirmatory factor analysis (CFA).

Results and Discussions

The median age of the HCWs was 44 years. The GHQ-12 median score was higher (25) in women and (24) in men, $p=0.044$. The determinant for the correlation matrix was $=0.047$, the Barlett test of sphericity was $p<0.001$, Chi square $=2086.9$ and Kaiser-Meyer-Olkin (KMO) of sampling adequacy was $KMO=0.86$. Factors identified were: Social-Dysfunction (37.8%), Anxiety-Depression (35.4%) and Stability (24.9%), accumulative value of 98.1%; and Valued. The entire sample had a Cronbach's alpha of 0.85, 0.69 for Social-Dysfunction, 0.74 for Anxiety-Depression, 0.52 for Valued and 0.64 for Stability in orthogonal (varimax) factor loadings. For oblique (promax) factor loadings; 0.75 for Social-Dysfunction, 0.75 for Anxiety-Depression, 0.52 for Stability and 0.54 for Valued. SEM confirmed Social-Dysfunction was associated with sleep worry, strain, difficulties; Anxiety-and-depression was associated with depressed, lost confidence, worthless; Valued was associated with useful, making decisions and Stability was associated with enjoy day-to-day activities, face up problems.

Conclusions

The GHQ-12 displayed adequate reliability and validity in measuring psychological distress of HCWs during the pandemic. HCWs had psychological stress during the COVID-19 pandemic. The factor structure suggested multidimensionality rather than a unique construct.



Ms Lucia Naddy Mhlongo, Pathology, NIOH

Ms Mhlongo is a medical scientist in the NIOH Pathology Division responsible for processing and analysing body tissue (mainly lungs) and bulk samples that may contain asbestos. This is a key function related to compensation for deceased miners, renovations of buildings with asbestos-containing materials, and the compilation of the annual Pathology Surveillance (PATHAUT) Report. Ms Mhlongo is also responsible for research development and support. She has a BSc degree in medical science from the University of Limpopo, a postgraduate diploma in public health from the University of KwaZulu-Natal (UKZN), and an MSc degree in medicine from Sefako Makgatho Health Sciences University. Her area of research is cancer immunology and occupational health.





Title: Occupational Cardio-respiratory diseases in South African miners at autopsy: The First Pathology Surveillance Report within the COVID era

Lucia N Mhlongo¹, Zethembiso B Ngcobo¹, Delerise Fassom¹, Kerry Wilson³, Jill Murray⁴, Deepna G Lakhoo^{1,2}

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2 School of Pathology, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa.

3 Epidemiology Department, National Institute for Occupational Health, National Health Laboratory Service, Johannesburg, South Africa.

4 School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa.

Correspondence: LuciaM@nioh.ac.za

Abstract:

Introduction

The pathology division at the National Institute for Occupational Health (NIOH), provides autopsy services of deceased people who have worked at a controlled mine or a controlled works in accordance with the Occupational Diseases in Mines and Works Act, 1973 (Act 78 of 1973). Dust related to mining and works expose individuals to various occupational diseases and malignancies. A detailed report on each case examined is sent to the Medical Bureau for Occupational Diseases (MBOD) to determine presence and severity of compensable occupational diseases, recommendations for compensation are sent to the Compensation Commissioner.

Objectives: The report describes occupational cardiorespiratory diseases in South African miners at autopsy in 2020, contribution of age, commodity and employment duration is also analysed.

Methods

Cardiorespiratory organs of 557 deceased South African miners and ex-miners were examined using histotechniques, light and electron microscopy. The findings of the analysis were captured and stored in the PATHAUT (Pathology Automation System) database. Data was retrieved from PATHAUT and analysed using SAS Enterprise Guide v 7.1.

Results

Majority (54.5%) of the cardiorespiratory organs analysed were from black individuals, 45.1% were white individuals and 0.4% were from coloured individuals. Of these organs only 5.2% were from females. The mean age at autopsy was 54.9 and 69.9 years for black and white men, respectively. The clinical cause of death in the majority of the cases (15.1%) were reported as diseases of the respiratory system, seven cases were stated as COVID-19 related deaths. The overall rate for Pulmonary tuberculosis was 153/1000, silicosis 223/1000, asbestosis 79/1000 and mesothelioma 48/1000, there were no cases of coal workers' pneumoconiosis and mixed dust pneumoconiosis.

Conclusion

The rates of PTB and Silicosis remain high, though a decrease was noted in 2020.



Ms Lerato Monatisa, Analytical Services, NIOH

Ms Monatisa, joined the NIOH Analytical Services Section as a Medical Scientist Intern in January 2021. She holds a National Diploma in Analytical Chemistry, Bachelor of Technology (BTech) in Chemistry, and a Master of Technology degree (MTech) in Chemical Engineering (specialising in water sciences) from the University of South Africa. Ms Monatisa's MTech research focus was on the physicochemical testing of environmental samples such as oil-contaminated effluents for attaining regulatory compliance and as well for research and development purposes. During her academic journey, she has been exposed to the use of a number of analytical laboratory techniques including gas chromatography, liquid chromatography, UV-Vis, and fourier transform infrared spectroscopy - among others - for analysing different types of samples. During her master's degree studies, she also learned to use statistical and modelling tools to develop a scientific model to check compliance of oily wastewater effluents.

Title: Spectrophotometric method development and validation for application in occupational exposure assessment of Trichloroethylene

Lerato Monatisa, Puleng Matatiele, Poobalan Pongavanum, Lerato Manamela, Boitumelo Dabula, Boitumelo Kgarebe

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Abstract:

Introduction

Chlorinated solvents such as trichloroethene (also known as trichloroethylene or TCE) are widely used in the chemical industry. However, personnel in those occupations who may be exposed to such toxic solvents are subjects to potential health risks. Workers who face such health risks include those involved in the manufacture of TCE, workers using degreasers that contain TCE, workers in the dry cleaning industry using chlorinated solvents, etc. The predominant route of entry during exposure to TCE is via inhalation and the less common entry routes include ingestion and dermal.

Analytical Method for TCE

This spectrophotometric method is based on a modified Fujiwara reaction in which TCE is treated with pyridine in an alkaline medium to give a coloured Schiff base. The colour of the Schiff base is discharged by adding acetic acid followed by the addition of 4-aminoacetanilide. The TCE derivative thus formed has a conjugated structure with strong chromophores that absorb light in the UV-Vis region at 520 nm. The concentration is directly proportional to the absorbance of the solution at this wavelength. The effects of different parameters such as temperature, time, reagent concentration, and pH were investigated and optimized for complete colour reaction.



Results and Discussion

The development and validation of a spectrophotometric method for the determination of TCE in urine are here outlined. The limit of quantitation was found to be 0.54 $\mu\text{mol/L}$ and determination of coefficient (r^2) values for the linear range of 0.54–700 $\mu\text{mol/L}$ were 0.99. The precision and accuracy for intra-day and inter-day were between 80–110% recovery.

Conclusion

The method is rapid, simple and sensitive. Based on the above validation results and the calculated figures of merit, this method is deemed suitable for the routine analysis of TCE in urine.

References

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- NIOH0338 – Criteria for accepting results.



Dr Wells Utembe, Toxicology & Biochemistry, NIOH

Dr Utembe is a Senior Medical Scientist in the Toxicology and Biochemistry Section at the NIOH where he has conducted studies on toxicology and risk assessment of various chemicals such as heavy metals, nanomaterials and pesticides. He holds a PhD in Public Health degree from the University of the Witwatersrand, a Masters in Environmental Sciences degree from University Putra Malaysia and a BSc (Honours) in Chemistry degree from the University of Malawi. In addition, Dr Utembe holds an honorary position at the University of Cape Town, where he has been involved in the online postgraduate Diploma in pesticide risk assessment and management. He is also an honorary member of staff in the Department of Environmental Health of the University of Johannesburg, where he is involved in the online Masters in Public Health Programme. He supervises many masters and PhD in public health students.





Title: Factors affecting pulmonary tuberculosis (PTB) treatment outcomes in Mamelodi Township

Tullu Khumalo^{1,2} and Wells Utembe^{2,3,4}

1 Mintek

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3 Toxicology and Biochemistry, National Institute for Occupational Health,

4 Environmental Health Division, School of Public Health and Family Medicine, University of Cape Town, South Africa

Correspondence: wellsu@nioh.ac.za

Abstract:

Introduction

Monitoring the treatment outcomes of Tuberculosis (TB) is essential for the improvement of its treatment efficiency and management. The aim of this study was to assess and determine factors associated with poor pulmonary TB treatment outcomes (successful, unsuccessful; defaulted, died, failed), in Mamelodi Township communities from 2013 to 2017.

Methods

A retrospective study was conducted using data that is routinely captured in the NHLS CDW FM10069 database. Pulmonary TB cases were older than 18 years of age with a recorded pre-treatment smear result, on anti-TB treatment, and treatment outcomes over the period 2013-2017. Multivariate logistic regressions were performed in SPSS version 26 to assess the relationship between treatment outcomes and the sociodemographic factors and some clinical variables.

Results

The treatment success rate was 85.6% while the mortality rate (2.6%) was lower than the WHO target of 3%. Those aged 50 years and above had significantly increased odds of having poor TB treatment outcomes (OR = 6.16, 95% CI 2.39-15.83) compared to those aged 18-29 years. Those who were HIV positive had significantly increased odds of having poor TB treatment outcomes (OR=1.99, 95% CI: 0.99-4.01) compared to those who had unknown HIV status. Patients that resided in Stanza B had a successful treatment rate of 90% and statistically significant reduced odds (OR=0.36, 95% CI: 0.11-1.18) of having poor treatment outcomes compared to those that came from Holani C/Itsoseng (the reference location).

Conclusion

The rate of successful TB treatment outcomes among Mamelodi Township patients was higher than the target set by the WHO. Age group, being HIV positive were the only variables significantly associated with poor TB treatment outcomes, while residing in Stanza B was associated with successful TB outcomes.

Keywords: Tuberculosis, Poor TB treatment outcomes, Mamelodi Township, Retrospective study



Mr Jonathan Ramodike, Epidemiology & Surveillance, NIOH

Mr Ramodike is a medical scientist for the Epidemiology and Surveillance Division at the National Institute for Occupational Health (NIOH), a division of the National Health Laboratory Service. Jonathan is also a public health masters candidate at the School of Health Systems and Public Health University of Pretoria.

Title: Factors associated with COVID-19 vaccine uptake among hospital admitted health workers in South Africa: 2020 to 2022 (preliminary analysis).

Jonathan Ramodike^{*1,2}, Nonhlanhla Tlotleng^{1,2,3}, Nisha Naicker^{1,3}

1 National Institute for Occupational Health, Johannesburg, South Africa

2 School of Health Systems and Public Health, Faculty of Health Sciences, University of Pretoria

3 Department of Environmental Health, Faculty of Health Sciences, University of Johannesburg

Correspondance: JonathanR@nioh.ac.za

Abstract:

Background

Health workers (HWs) have an increased risk of acquiring coronavirus disease 2019 (COVID-19) because of the nature of their work amongst several other factors. Little is known about COVID-19 vaccination uptake in Africa. This study sought to understand South African HWs' COVID-19 vaccination uptake and its hypothesized determinants.

Objectives

This study describes the characteristics of admitted HWs in SA and assess factors associated with in hospital admissions and vaccine uptake.

Methods

This was a cross sectional survey. Data from March 5, 2020 to October 30, 2022 were obtained from a national hospital surveillance system monitoring COVID-19 admissions. Data was cleaned and analysed using Microsoft excel and STATA. Regression analysis was done on STATA.

Results

Of the surveyed HWs', 83.4% had received the COVID-19 vaccine. The findings showed a statistically significant increased likelihood of the hospitalised HWs to have received the COVID-19 vaccine if they are a doctor, nurse, admitted in health facilities in Eastern Cape, KwaZulu-Natal and Western Cape. Statistically significant decreased odds to have received the COVID-19 vaccination were observed in admitted HWs who were male, of the Indian and Caucasian ethnic groups, admitted in a public health facility, had diabetes and were HIV positive.

**Conclusion**

There was good COVID-19 vaccination uptake and HWs that were vaccinated generally had reduced odds of in-hospital mortality, although immunocompromised patients in the study had persistently high risk of mortality despite being vaccinated. Future research should include qualitative research to seek to identify determinants and mechanisms, in order to inform intervention strategies for groups found to be less likely to be vaccinated. The information about what influences vaccine decisions and behaviours can be used by the global health community to design effective implementation strategies and behavioural interventions to ensure high coverage of the COVID-19 vaccine.

Keywords

SARS-CoV-2, Vaccination uptake, Mortality, Morbidity, Hospital Surveillance, Health Workers, Hospital Admissions.





Digital poster presenters Bio-sketch & Abstract



Ms Evida Poopedi, Immunology & Microbiology, NIOH

Ms Poopedi holds MSc in clinical microbiology. She is currently pursuing a PhD in Immunology and Microbiology section under the supervision of Dr Tanusha Singh and Dr Noncy Gomba. Her research focuses on assessing occupational health risks associated with bacterial pathogens among wastewater treatment plant (WWTP) workers. Through her work, she aims to generate scientific evidence on work-related risks in WWTP workers in order to inform the development of an intervention and to guide policies to reduce or minimize exposures to microbiological pathogens for WWTP workers.

Title: Preliminary findings on the presence of respiratory and enteric pathogens in wastewater: A potential risk of infection for municipal wastewater treatment plant workers

Evida Poopedi^{1,2}, **Tanusha Singh**^{1,2,3}, and **Annancietar Gomba**¹

1 Department of Immunology and Microbiology, National Institute for Occupational Health, National Health Laboratory Service

2 Clinical Microbiology and Infectious Diseases, Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

3 Environmental Health, Health Sciences, University of Johannesburg, Johannesburg, South Africa

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Abstract:

Introduction

Limited information exists on the occurrence of microbial pathogens in wastewater and its impact on workers' health. Investigating the presence of human pathogens in wastewater can help in identifying potential health risks for wastewater treatment plant (WWTP) workers. This study aimed to determine the occurrence and levels of respiratory pathogens (*Legionella pneumophila*, *Mycobacterium* spp.) and emerging enteric pathogens (*Aeromonas hydrophila*, *Arcobacter butzleri*) in untreated and partially treated municipal wastewater.

Methods

Grab samples (influent, activated sludge, and secondary settling tank (SST) effluent) were collected every second week over six months (November 2021 to April 2022) from five WWTP in the city of Tshwane. *Mycobacterium* spp., *A. butzleri*, and *A. hydrophila* were detected using quantitative real-time PCR, while *L. pneumophila* was detected using the IDEXX Legiolert assay.



Results and discussion

A majority of the samples showed the presence of all four pathogens, albeit at varying concentrations. The positivity rate for viable *L. pneumophila* was 92% (162/176) at concentrations ranging from 2.04 to 5.36 log MPN/100 mL. *Mycobacterium* spp. was detected in all samples (100%; 65/176) at concentrations ranging between 3.72 -7.07 log GC/200 mL for influent, 4.64 -8.14 log GC/200 mL for activated sludge, and 2.98 - 8.42 log GC/200 mL for SST effluent, with activated sludge and SST effluent showing almost similar levels. *A. butzleri* and *A. hydrophila* were detected in 98% and 91% of the samples, respectively. *A. butzleri* concentrations in the influent, activated sludge and SST effluent were 1.46 -7.20, 1.92 -6.23, and 1.43 -6.88 log GC/200 mL, respectively. Relatively similar levels were detected for *A. hydrophila*. Generally, higher levels of *L. pneumophila* and *Mycobacterium* spp. were detected in activated sludge compared to other sample types. Conversely, the concentration of enteric pathogens decreased from influent to SST effluent.

Conclusion

These findings revealed a high detection frequency for respiratory and enteric pathogens in wastewater at different treatment points, suggesting potential occupational exposure to pathogens.



Ms Angela Mawela, Analytical Services, NIOH

Ms Mawela holds a National Diploma in Biotechnology- University of Johannesburg, a BSc in Environmental management, and is currently doing honours at University of South Africa. Ms Mawela is a Biotechnologist at the NIOH- Analytical Services since 2011. She has completed in FIMS, AAS and ICP MS for the analyses for a wide scope of heavy metals in biological and environmental matrices SANAS accredited technical signatory under ISO 17025 for Mercury and Aluminium in water samples.





Title: Validation of a method for the routine determination of Zinc in urine by Inductively Coupled Plasma Mass Spectrometry

Poobalan Poongavanum, Angela Mawela, Lesiba Sethosa, Sesitjie Moremi, Jane Mulaudzi, Lerato Manamela, Boitumelo Kgarebe

Authors' affiliation

Analytical Services Laboratory, National Institute for Occupational Health, National Health Laboratory Service.
Disclosure: The authors declare that they have no competing interests.

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Abstract:

Background:

Zinc (Zn) is one of the most common elements in the earth's crust and is an essential micronutrient for human health. Zn serves many structural and biochemical roles. Intensive research has been conducted with the aim of identifying a reliable and sensitive biomarker of Zn status¹. Herein lay the motivation for the validation of a method for the routine determination of Zn in urine.

Materials and Methods:

A method for analysis of Zn in urine by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) was developed and validated with the use of two Bio-Rad Lyphochek urine certified reference materials (CRMs), Lyphochek Level 1 and Level 2. Their recommended $\pm 2sd$ ranges were 73.00 – 148.20 $\mu\text{g/L}$ and 133.24 – 212.56 $\mu\text{g/L}$ respectively. A data set of 30 measurements per CRM was used to determine the validity of the method. Validation was based on key figures of merit, to name a few, Accuracy, Precision and Uncertainty of Measurement^{2,3}.

Results

Accuracy of the method was assessed from average recoveries with acceptance criteria (AC) of 80-110%. Recoveries were 94.59% and 83.51 % for Lyphochek Level 1 and 2 respectively. Precision was expressed as the Relative Standard Deviation (%RSD) with observed %RSDs of 3.05% and 3.30% respectively (AC: $\leq 20\%$). The Expanded Uncertainty of Measurement with a coverage factor of $K=2$ and a confidence interval of 95% was 9.96%.

Conclusion

Based on the results obtained for the figures of merit, the method for the routine determination of zinc in urine by ICP-MS is deemed 'Fit for Purpose'.

References

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Refilwe Moepya, Analytical Services, NIOH

Ms Moepya is a PhD candidate at the University of the Witwatersrand in the school of chemistry. Her career objectives include building a professional career in the applications of Mass Spectrometry where she can contribute towards sharing knowledge and skills through research. Ms Moepya has been part of the Wits Mass spectrometry team for almost five years where she worked as a research and technical assistant. Refilwe has presented her research work at the 17th Annual Conference of the Metabolomics Society and is a member of the Metabolomics Society. Through research and collaboration, she has co-authored three articles in international peer-reviewed journals.



Title: Qualitative and quantitative characterization of arsenic-binding peptides by LC-ESI-MS for the development of an arsenic point-of-care device for the South African mines.

Refilwe Moepya¹, Maya Makatini,¹ Boitumelo Kgarebe,² Nosipho Moloto¹

1 Molecular Science Institution, School of Chemistry, University of the Witwatersrand.

2 Department of analytical services, National institute for occupational health, National Health Laboratory Service.

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Abstract:

Introduction

South Africa is a country known for its abundant mineral resources. Although mining is important to the economy, it produces large quantities of dust containing harmful heavy metals. Arsenic is currently a huge health concern due to its carcinogenic properties. Laboratory methods such as inductively coupled plasma mass spectrometry, and atomic absorption spectrometry are the first point of analysis for arsenic identification and detection. Their major drawback includes the long turnaround time between sample collection, analysis, and data processing. As a result, the design of a peptide-based biosensor will allow for the early detection of arsenic poisoning in urine samples. The study aims to qualitatively and quantitatively investigate the binding affinity of arsenic to sulfur-containing ArsR-derived peptides using the LC-ESI-MS for the design of a point-of-care device that will be used for arsenic monitoring in South African mines.

Methods

The solid-phase peptide synthesis strategy was used to synthesize ArsR-derived peptides. Reversed-phase liquid chromatography and electrospray ionization mass spectrometry were used to determine the binding affinity of the peptides to arsenic metabolites. The effect of pH, temperature, arsenic concentration, reaction time, and peptide concentration on binding was also investigated.

Results and Discussion

All ArsR-derived peptides were successfully synthesized and showed selective binding towards arsenic metabolites in the presence of other metals. Optimum arsenic binding was observed at pH8, a temperature of 40 °C, an initial arsenic concentration of 60 µM, at binding reaction time of 15 minutes, and a peptide dosage of 25 µM. The peak areas on the LC-ESI-MS were successfully used to calculate the equilibrium constant for the interaction of ArsR-peptide with arsenic metabolites. The following order of binding affinities was observed: Phenylarsine oxide > arsenite > dimethylarsenic acid.

Conclusion

ArsR-derived peptides can effectively and selectively bind urinary arsenic metabolites and LC-ESI-MS is an efficient tool for the quantitation of arsenic.



Ms Sabine Kirchner, Analytical Services, NIOH

Ms Kirchner forms part of the 2022 BHSc Forensic Science Honours students from the University of the Witwatersrand, and will graduate cum laude this year (2022). She was awarded her undergraduate degree from the University of Stellenbosch in 2020, majoring in genetics and psychology. She is also her Honours course class representative and works as a volunteer scribe at the Johannesburg FPS Medico-legal mortuary (JHB MLM), under the ICRC, handling sampling of DNA evidence from unidentified deceased individuals. Work in this field has allowed her to assist in cases such as the 21 unidentified suspected illegal miners found dead in Krugersdorp earlier this year. She is aiming to pursue a career in toxicological investigation or the development of pharmaceuticals in clinical trials through further studies and to become registered under the HPCSA.



Title: The impact of Covid-19 lockdown restrictions on suspected suicide prevalence at the Johannesburg Forensic Pathology Services Medico-legal Mortuary

¹
Sabine Kirchner
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Supervisors:

Dr Boitumelo Kgarebe (PhD), National Institute for Occupational Health, National Laboratory Health Service
Dr Puleng Matatiele (PhD), National Institute for Occupational Health, National Laboratory Health Service
Dr Craig Keyes (PhD), University of the Witwatersrand Faculty of Health Sciences.

Abstract:

Introduction

Most literature agrees that suicidal behaviours develop as a result of both intrinsic and extrinsic risk factors, however the degree to which these factors are responsible remains under investigation. During the implementation of lockdown restrictions in South Africa due to the Covid-19 pandemic, several external stressors such as social isolation, financial instability and strained interpersonal relationships were emphasised, leading to a growing concern that these negative mental health consequences would be reflected as an increase in suicide mortality.

Methods

This study aimed to determine the effects of Covid-19 national lockdown restriction levels on suspected suicides in 2020 and 2021. Death registers and victim case files were reviewed at the Johannesburg Forensic Pathology Services Medico-legal Mortuary (JHB FPS MLM), to document suspected suicide cases during 2019 (before lockdown), and 2020 to 2021 (during lockdown). Decedents' information was recorded according to age, sex, race and employment status, along with the chosen method of suicide by decedents. Statistical analysis was conducted to understand suspected suicide trends and compare relative suicide rates.

Results and Discussion

It was found that no significant difference (p -value=0.76) was seen in the suicide rate from 2019 (before lockdown) to 2020, nor was there a clear association between the severity of lockdown restriction levels and the rate of suspected suicides. Additionally, demographics of decedents before and during lockdown remain largely unchanged and reflect the typical population demographics of Johannesburg, with the most suspected suicides occurring among black males between the ages of 21 to 40 years. There was also no significant association (p -value=0.5) between the employment status of individuals and suspected suicide. Lastly, the chosen methods of suicide did not vary greatly and reflected past research with hanging remaining the most common.

Conclusion

There was no notable increase in suspected suicide mortality following the implementation of lockdown restrictions by the South African government.



Ms Zethembiso Ngcobo, Pathology, NIOH

Ms Ngcobo is a senior medical scientist in the Pathology Division, where she is responsible for co-managing research projects and facilitating the development and validation of new tests. Ngcobo also co-manages the Electron Microscopy Unit, contributes to the total quality management, carries out laboratory work, and writes reports. She holds Bachelor and Master of Medical Science degrees in medical microbiology (the former, cum laude), and a BSc degree in microbiology and biochemistry – all from UKZN. Ms Ngcobo's current research focus is on occupational and environmental asbestos, and the development of pathological molecular tests. In 2022, she obtained a PhD scholarship from the Institute for Nanotechnology and Water Sustainability (iNanoWS).

Title: How far are we in ending the legacy of asbestos: an overview from the 2021 surveillance report?

Zethembiso Ngcobo¹, Lucia Mhlongo¹, Mark Keyter^{1,2}, Jana de Bruin^{1,2}, Deepna Lakhoo^{1,2}

1 Pathology Division, National Institute for Occupational Health, National Health Laboratory Service, Johannesburg, South Africa

2 Department of Anatomical Pathology, School of Pathology, Faculty of Health Sciences, University of the Witwatersrand, Parktown, South Africa

Correspondence: ZethembisoN@nioh.ac.za

Abstract:

Introduction

Asbestos is a confirmed carcinogen. Several studies have shown that exposure to this fibrous silicate mineral in and outside the workplace contributes to the burden of asbestos-related disorders. In 2020, the South African government published new Asbestos Abatement Regulations, however no deadline for when all buildings must be asbestos free was set. The responsibility to set up policies and procedures to ensure that the environment is asbestos free for their employees is bestowed upon employers. The National Institute for Occupational Health (NIOH) provides an asbestos fibres analysis service on materials suspected to contain asbestos. Surveillance of asbestos-containing materials both in occupational and environmental settings is pivotal in monitoring the elimination of exposure to asbestos. This report describes the prevalence of asbestos-containing materials in the data collected and stored in an in-house electronic database in 2021.



Results and Discussion

It was found that no significant difference ($p\text{-value}=0.76$) was seen in the suicide rate from 2019 (before lockdown) to 2020, nor was there a clear association between the severity of lockdown restriction levels and the rate of suspected suicides. Additionally, demographics of decedents before and during lockdown remain largely unchanged and reflect the typical population demographics of Johannesburg, with the most suspected suicides occurring among black males between the ages of 21 to 40 years. There was also no significant association ($p\text{-value}=0.5$) between the employment status of individuals and suspected suicide. Lastly, the chosen methods of suicide did not vary greatly and reflected past research with hanging remaining the most common.

Conclusion

There was no notable increase in suspected suicide mortality following the implementation of lockdown restrictions by the South African government.



**Dr Jitcy Joseph, Toxicology & Biochemistry, NIOH**

Dr Joseph is a Senior Medical Scientist at the Department of Toxicology and Biochemistry, at NIOH. Dr Jitcy is currently holding an NRF Thuthuka Research grant for 2022 to 2024 and she is supervising postgraduate students. Before that, she was a postdoctoral fellow at the University of South Africa, performing research on anti-cancer drug discovery. She was also a Postdoctoral Fellow at North-West University; Potchefstroom, researching biomarkers associated with HIV and cardiovascular disease. She graduated with her Ph.D. in Biochemistry from the University of Johannesburg in South Africa, in 2016 and she received an NRF scholarship. She earned her Master's in Biochemistry from Mahatma Gandhi University in India, in 2005, and was awarded the first-rank position. In her Ph.D. thesis work, she pioneered a therapeutic modality for the better treatment and management of type 2 diabetes and obesity. She was also awarded the NRF innovation postdoctoral fellowship for 2018. Jitcy completed the ISO 15189:2012, ISO 17025:2017, ETD-P-SETA Assessor (NQF level 5) and Moderator (NQF level 6) and GLP OECD training courses. Jitcy work in collaboration with various universities including University of Johannesburg, University of Free State, UNISA and Dalhousie University.

Title: Exercise increases the expression of glucose transport and lipid metabolism genes at optimum level time point 6 h post-exercise in rat skeletal muscle

Jitcy S Joseph¹, Oladapo F Fagbohun²

1 Department of Toxicology and Biochemistry, National Institute for Occupational Health, National Health Laboratory Service

2 Department of Plant, Food, and Environmental Sciences, Faculty of Agriculture, Dalhousie University, Truro, NS, Canada

Correspondence: JitcyJ@nioh.ac.za

Abstract:**Introduction**

Studies have suggested that type 2 diabetes (T2D) is associated with various occupational health outcomes, including work-related injury, loss of work productivity due to absenteeism, and the types of occupations. Exercise or physical activity is one of the cornerstones for the prevention and management of T2D. Individuals who suffer from T2D are partly characterized by the down-regulation of glucose transport and mitochondrial lipid oxidizing genes. The Nuclear respiratory factor, (Nrf)-1, is a mitochondrial transcriptional factor shown to be involved in glucose transport and acts as a potential therapeutic modality in the management of T2D. In this study, we accessed the optimum time point increase or decrease of Nrf-1 and its target gene expression after exercise.



Methods

Five- to six weeks old male Wistar rats were exercised to identify the time point for an optimum increase in the levels of NRF-1 and target genes. Gastrocnemius muscles were harvested after 0, 2, 4, 6, 8, 10, 12, and 15 h post-exercise and from non-exercise rats. Primers were used to amplify the region of the genes; Nrf-1, glucose transporter (Glut)-4, carnitine palmitoyltransferase (Cpt)-1, myocyte enhancing factor (Mef)-2a, and acetyl-CoA carboxylase-(Acc)-1. Relative mRNA expression was normalized to the Actin reference gene.

Results and Discussion

Cpt-1, Nrf-1, Mef2a and Glut4 showed 2.5, 8.0, 1.2, and 4.1 folds increase, respectively after 6 h post-exercise compared with control. Whereas Acc-1 showed a 3.1-fold decrease in gene expression ratio after 6 h post-exercise.

Conclusion

In conclusion, the optimum time point of most glucose transport and lipid metabolism genes is 6 hr post-exercise. Physical activity or exercise could reduce the risk of many diseases including T2D and can increase productivity in the workplace and lower worker absenteeism and turnover.





Ms Millicent Magogotya, Toxicology & Biochemistry, NIOH

Ms Magogotya is a Biotechnologist at the Department of Toxicology and Biochemistry at the NIOH. Millicent graduated with her Masters in Biotechnology from the Tshwane University of Technology in South Africa, in 2021 and she is a member of the Advisory board of the Department of Biotechnology and Food Technology at the Tshwane University of Technology.

Millicent has presented her research work at various conferences and published 2 articles in international peer-reviewed journals. She is also a registered Certified Natural Scientist with the South African Council for Natural Scientific Profession (SACNASP).

Title: Gold nanoparticle (AuNP) uptake and toxicity in representative cells

Millicent Magogotya^{1,2}, **Melissa Vetten**¹ and **Mary Gulumian**^{1,3}

1 Department of Toxicology, National Health Laboratory Service, Braamfontein, South Africa

2 Department of Biotechnology and Food Technology, Tshwane University of Technology, Pretoria, South Africa

3 Haematology and Molecular Medicine, University of the Witwatersrand

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Abstract:

Introduction

The most common routes of nanoparticle exposure include ingestion and transdermal delivery. Workers are accidentally exposed during the synthesis of the nanomaterials. In this study, the uptake, cytotoxicity and genotoxicity of 14 nm negatively charged citrate-stabilized gold nanoparticles (AuNPs) and positively charged PEG-liganded amine AuNPs were assessed on human epithelial colorectal adenocarcinoma (Caco-2) cells and the human skin keratinocyte (HaCaT) cells.

Methods

The uptake of AuNPs in the cells was observed through the darkfield CytoViva hyperspectral imaging system (HSI). The xCELLigence real time cell analysis (RTCA) system was used to assess cytotoxicity between 0.5 nM and 5 nM of AuNPs. For the assessment of genotoxicity, the in vitro micronucleus assay was used.

Results and Discussion

Dark field images were acquired and AuNP uptake was observed in both cell cultures, with highest levels of citrate-stabilized AuNPs. The 14 nm citrate-stabilized AuNPs were cytotoxic to the HaCaT cells, however, the 14 nm amine-AuNPs were observed to be non-cytotoxic, even at the highest concentration. Dose-dependent genotoxicity was observed in both Caco-2 and HaCaT cells treated with the citrate-stabilized and amine AuNPs.

Conclusion

Even though AuNPs entered the cells, only the citrate-stabilized AuNPs showed cytotoxicity. Therefore, non PEGylated AuNPs enters the cells better than their PEGylated counterparts. Cytotoxic and non-cytotoxic AuNPs were genotoxic to the Caco-2 and HaCaT cells.

**Ms Karen du Preez, Occupational Hygiene, NIOH**

Ms du Preez is employed as Occupational Hygienist and Technical Signatory at the Occupational Hygiene Section of the NIOH since 2017. She currently holds the position of a Technical Manager. The Section is an Approved Training Provider for the Occupational Hygiene Training Association (OHTA)'s training modules, and Karen is actively involved in the coordination and presentation of these modules. She's obtained the B. Sc. Physiology degree at NWU, the Certificate in Occupational Hygiene at TUT, the Intermediate Certificate in Mine Environmental Control, and is currently finalising studies towards the MPH degree at UP. She has 18 years' work experience in the implementation and maintenance of Occupational Hygiene programmes at various industries and opencast mining operations, and is registered with SANAS as Technical Assessor for Inspection Bodies (ISO/IEC 17020) since 2019.

Karen has been registered with the Southern African Institute for Occupational Hygiene (SAIOH) at Occupational Hygienist level since 2009, has been a member of the Professional Certification Committee (PCC) since 2014, served as Chairperson of the PCC from 2020 to 2021, and was recently nominated as Vice-President for the 2023-2024 term.

Title: A comparison of the amended occupational exposure limits (maximum limits) promulgated in the Regulations for Hazardous Chemical Agents with International limits and the anticipated impact on the South African Industry

Karen du Preez^{1,2}, Dr Nico Claassen²

1 Occupational Hygiene Section, NIOH a division of the NHLS, 2 School of Health Systems and Public Health, University of Pretoria

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The recently promulgated Regulations for Hazardous Chemical Agents introduced updated lists of occupational exposure limits which are legally binding standards in South Africa. Chemicals known to be carcinogens, sensitizers, mutagens or teratogens, were typically assigned maximum limits. Occupational exposure to these chemicals must be maintained as far below the assigned maximum limit as can be achieved, by applying control measures other than personal protective equipment. Significant reductions in maximum limits may require intensive revisions or changes to existing control measures to achieve compliance with the limits.

The study objectives are to identify hazardous chemical agents which were assigned maximum limits which were reduced by 50% or more, to compare the occupational exposure limits of these hazardous chemical agents with international limits assigned to the same chemical, to describe the industries where exposure to these chemicals can occur and to describe the impact that the reduction of limits may have on industries regarding implementation of suitable control measures.



This will be a cross-sectional, descriptive study, and no statistical analysis will be performed to determine associations or trends. Data will be obtained from current and previously promulgated South African occupational exposure limits, the GESTIS-ILV database containing international occupational exposure limits and the CDC ASTDR, International Chemical Safety Cards and other relevant databases to obtain toxicological and exposure data on the applicable chemical agents. Questionnaires will be used to gather information regarding the impact of reductions in OELs on industries where exposure to these substances occurs.

The study may help to understand challenges and successes experienced by affected industries due to significant reductions in occupational exposure limits, which may be useful to the chemical industry, Occupational Hygienists and the Department of Employment and Labour.

The protocol was submitted to the University of Pretoria Faculty of Health Sciences Research Ethics Committee, awaiting approval.





Research Day 2022 Scientific Sub-Committee



Dr Natasha Sanabria
Chair: Coordinator



Dr Nonhlanhla Tlotleng:
Deputy Research Committee Chair
and Session Chair: Review and poster
abstract submission



Dr Boitumelo Kgarebe
Session Chair: Review and Oral
abstract submission



Dr Noncy Gomba
Logistics and Session Chair: Occ
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Mr Thabane Zwane
IT Support



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IT Support



Mr Vuyo Sabani
Communication & Marketing



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- Dr G Chin
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- Mr D Jones
- Dr J Joseph
- Ms T Maeteletjia
- Ms M Masema
- Ms D Matuka
- Prof N Naicker
- Dr M Ndaba
- Mr G Mizan
- Mrs Maria Peterson-Genade
- Dr T Singh
- Dr K Wilson

I thank you all for your selfless contributions -- Dr N Sanabria



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