THE BURDEN AND COST OF SICKNESS ABSENTEEISM AMONGST HEALTHCARE WORKERS AT A TEACHING HOSPITAL IN SOUTH AFRICA.

A CROSS-SECTIONAL STUDY.

By

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MPH mini-dissertation protocol

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DECLARATION

I, Muhammed Adil Khan……., hereby declare that the work on which this dissertation/thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

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Acronyms and abbreviations

BCEA – Basic Conditions of Employment Act

DA – Duration of Absence

FP – Frequency Persons

FR – Frequency Rate

HCW – Healthcare worker

ICOH – International Commission on Occupational Health

LMIC – Low- and Middle- Income Countries

HR – Human Resources

PILIR – Policy and Procedure on Incapacity and Ill-Health Retirement

SAR – Sickness Absence Rate

SRA – Sickness-Related Absenteeism

Part A: Protocol

Introduction

Background

The Covid-19 pandemic has exposed the fragility of the healthcare system globally and in South Africa. Increasing absenteeism amongst HCWs in this time due to mandatory quarantine or COVID-19-related sickness has brought the strain on human resources in the health sector sharply into focus. However, prior to the pandemic, there were already existing and longstanding problems with the limited human resources in the health sector. In the middle-income country of South Africa, the World Health Organization (WHO) estimates that there are only 9 doctors per 10 000 people, which is well below the average compared to countries of similar socio-economic standing[1].

The effects of a high burden of absenteeism amongst HCWs include potentially reduced health service delivery and increased costs[2-3]. The cost of workplace absenteeism across all sectors is increasing globally[4]. In South Africa, around US$ 1.2 billion is lost annually across all sectors due to absenteeism[5]. International literature suggests that the health sector is no different in experiencing high direct costs due to absenteeism. A South African perspective of sickness-related absenteeism (SRA) costs in the health sector is yet to be determined but is hypothesized to be aligned with these international trends.

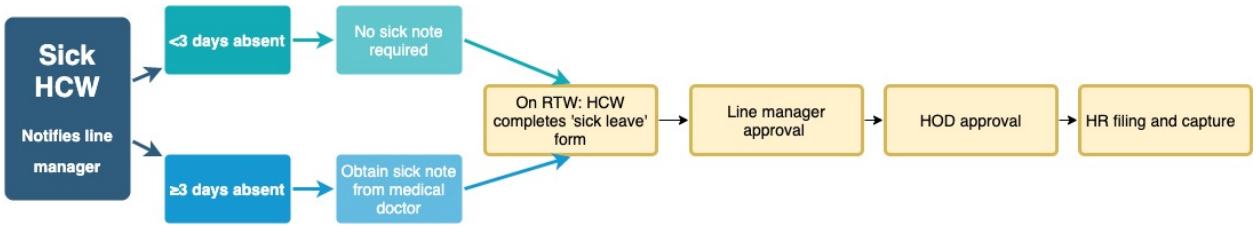
The underlying causes of SRA in the health sector vary according to the length of absence. Short-term SRA are predominantly due to acute, infective respiratory/gastrointestinal illnesses and musculoskeletal complaints, whereas long-term SRA is often more nuanced and compromises of long-term chronic illnesses and/or disability[6-7].

In adherence to the Basic Conditions of Employment Act (BCEA), paid sick leave is a contractual right of an employee at the hospital[8]. The employee is entitled to 36 sick leave days granted over a 3-year cycle. Should the employee exhaust the 36 day period, they may apply for incapacity leave in accordance with the Policy and Procedure on Incapacity and Ill-Health Retirement (PILIR)[9]. This is granted on a case-by-case basis following evaluation by a health risk manager and requires evaluation of medical reports submitted by the employee's treating medical doctor.

The study setting is a large tertiary, academic hospital situated in South Africa. The hospital has a total of 3,743 staff members, 66% of which are healthcare professionals and the remaining are administrative and support staff.

The process of applying for sick leave in the hospital is as follows (figure 1): the HCW contacts their line manager telephonically and indicates that he/she is not well and will request sick leave. A medical certificate is required after three or more sick leave days are taken. On return to work, the HCW completes a leave form indicating 'sick leave'. The sick leave form is sent to the line manager and head of department for approval and signature. The sick leave form is handed over to the HR department for capturing on a digital platform. The hard copy is sent for filing.

Figure 1: Sick leave process



RTW: Return to work; HOD: Head of department

Literature Review

Search Strategy

The purpose of the literature review was to understand and evaluate the existing literature about the prevalence, costs and medical conditions related to SRA amongst HCWs in LMICs. Articles were searched in English in PubMed/Medline as well as Google Scholar using the following key terms: "Healthcare worker OR healthcare professional AND Prevalence OR Cost OR Causes AND Absenteeism OR Sick leave". Additional articles were sought from the "similar articles search" in PubMed and "related articles" in Google Scholar, as well as from those cited in the reference of the chosen articles. Articles were screened first by title, followed by abstract and full review.

Prevalence of SRA

There were no studies that evaluated the prevalence of SRA of South African HCWs. There were a number of studies from similar LMIC's, however. There were two different methodologies used to determine SRA prevalence rate between studies.

The first methodology used was the Sickness Absence Rate (SAR). SAR is the total number of SRA days / the total potential working days for the study population. In LMIC settings, similar SAR were found by both Mollazadeh et al (1.1%) and Oche et al (1.5%)[7,10]. In a high-income setting, Gorman et al found a higher rate of 5.6%[11]. Reasons for the discrepancy could be the differences in settings, the differences in population sizes and the wider variety of HCWs included by Gorman et al as compared with Mollazadeh et al and Oche et al.

The second methodology used was to assess the prevalence of SRA as the number of HCWs absent in the period of study / population. Using this methodology, Al-Shammari et al (16%), Khawaja et al (12%), Chaudhury et al (35%) and Yamada et al (17%) showed a higher prevalence than studies using the SAR method[12-15]. Apart from the methodological differences, Chaudhury et al and Yamada et al presented all causes of absence and not SRA exclusively, which could further explain the higher SRA found.

An additional measure of SRA prevalence is the Frequency Spells (FS), which is sometimes referred to as the Average Frequency Rate (AFR). This is the total number of spells of SRA in a period / study population. Similar FS rates were reported by Mollazadeh et al (0.68) and Rocha et al (0.78)[7,16]. A higher FS was reported by Oche et al (1.4) and could be explained by the study including all causes of absence and not SRA exclusively[10]. A lower FS rate was found by Khawaja et al (0.13) which could be explained by the study being based in a high-income setting and the various study design flaws discussed in Table 1[13].

The Duration of Absence (DA) is the total number of SRA days/ number of SRA spells. Rocha et al found a DA of 21.5 days/spell which is considerably longer than the findings of Oche et al (2.4) and Khawaja et al (1.5). This could be explained by the Rocha et al study having an older average age of the population. Consequently, Rocha et al found more chronic illnesses and longer average duration, whereas Oche et al and Khawaja et al found more acute illnesses and shorter duration. Additionally, Rocha et al had a larger sample size and longer duration of study.

In terms of the demographic considerations, SRA prevalence was higher amongst females than males (Mollazadeh et al, Gorman et al, Rocha et al)[7,11,16]. This finding should be interpreted within the context that female HCWs outnumbered male HCWs in all the studies. Professions with a demanding physical nature (i.e. nursing) had the highest prevalence. Gorman et al correlated the higher SRA prevalence found in physically demanding professions with a higher SRA prevalence amongst lower wage earners, surmising that professions with a high manual work component will likely have lower wages. Most studies found that SRA was more prevalent amongst older HCWs.

Medical conditions associated with SRA

There were no studies found that evaluated the medical conditions associated with SRA in South African HCWs. Within an LMIC setting, studies evaluated both the short and long-term diseases associated with SRA. Short term SRA was associated with acute infectious diseases of respiratory, digestive system or other non-specific infections, and Musculoskeletal conditions[10,12, 13, 16]. Long term SRA was most associated with Musculoskeletal conditions[10-13, 16]. In addition, Rocha et al reported a high prevalence of mental health problems as an association of long term SRA[16]. This could be explained by the longer duration of study (two years), the study design that obtained ICD-10 codes from the occupational health clinic of the hospital directly and the study population consisting of mainly ICU and acute care staff. Khawaja et al reported Varicella Zoster (Chicken Pox) infections as the leading condition associated with long term SRA[12]. The short duration of the study (six months), low prevalence of long- term SRA and the disease only occurring in a subset of the population (ex-patriate HCW, possibly not immunized against Varicella) could explain their unique finding.

Cost of SRA

Productivity loss due to SRA is associated with high costs. These costs may be direct or indirect[17].The direct human capital cost of SRA is the total time missed due to SRA, multiplied by the HCW's Total Cost of Employment (TCE). When HCWs are absent within the bounds of their contract, the direct SRA costs are carried by the employer as the HCW will receive their full remuneration. There were no studies found that evaluated the cost of SRA of South African HCWs or in similar LMICs. Within a high-income setting, Gorman et al evaluated the total direct cost of SRA of HCWs as CDN$1,428 (US$ 1,134 Morningstar end of day prices as of 22/03/2022) per employee per year over a 1-year period[11]. This was calculated by

multiplying the total hourly wage of personnel absent due to sickness by the number of days absent due to sickness. To investigate an approach to SRA costing methodology further, the literature review was extended to studies of SRA costs outside of the health care environment. Nagata et al evaluated the costs of SRA in 4 pharmaceutical companies in Japan[18]. The average cost of SRA was US$520 per employee per year. The difference in findings can be explained by the variable settings, variable cost of healthcare and associated medical conditions.

Indirect/friction costs of SRA can be attributed to the loss of productivity or quality of the service provided, employee morale, costs to employ locum staff, amongst others[19]. This costing methodology of SRA is beyond the scope of this thesis.

Conclusion and Justification for research

SRA of HCWs could impact on health service delivery and the costs thereof. A South African perspective of the problems is yet to be determined. From the literature reviewed, none were found to have a high burden of SRA greater than 30 days (i.e. considered long term SRA). This is postulated to be different in South Africa given the nature of our disease burden that includes HIV and TB. TB may be particularly of relevance for HCWs given it is an occupational hazard in South Africa and may require prolonged absences from work.

From a cost perspective, there was minimal research found from an international setting. There was no SRA cost information found in a South African or LMIC setting.

The current study will evaluate the burden and direct costs of SRA. This unique study may empower hospital policy-makers to quantify the problem and drive strategic interventions for prevention of SRA. The findings may be of relevance to other health settings in the country and LMIC settings.

Table 1 – Studies investigating the prevalence and/or associated medical conditions and/or costs of sickness related absenteeism

Author, Year	Aim of study	Study design	Setting	Population	SRA Prevalence	Direct cost of SRA	Associated Medical Conditions	Study limitations
Al-Shammari et al, 1994[12]	To evaluate the prevalence and causes of SRA amongst HCWs in a teaching hospital in Saudi Arabia	Cross-sectional	High income	861 HCW	16%	N/A	Respiratory Infectious Digestive Musculoskeletal	- The cumulative total potential working days of all staff at the facility was not presented, which limits our understanding of the prevalence of SRA presented. - SRA Prevalence may not be fully representative as not all HCWs who were absent due to sickness would have attended the staff health clinic where the data was evaluated from - The overall number of HCWs at the teaching hospital were not given limiting our understanding of how the prevalence was calculated - Associated medical conditions were not defined as short or long term
Chaudhary et al, 2006[14]	To evaluate the prevalence of SRA amongst HCW and educators	Cross-sectional	LMIC	Not presented	35%	N/A	N/A	- The cumulative total of potential working days of all staff at the facility was not presented, which limits our understanding of the prevalence of SRA presented. - The study design did not allow the authors to evaluate how long the HCWs were absent from work. - It did not distinguish SRA and all other reasons for absenteeism. - It did not provide details about the healthcare facility nor the HCW themselves.
Gorman et al, 2010[11]	To evaluate the prevalence and costs of SRA amongst HCW in British Columbia, Canada	Cross-sectional	High income	36 858 HCW	5,6%	US$1138 Per employee	N/A	- The authors note that the dataset may have been incomplete as it was derived from a secondary data source (payroll data)
Khawaja et al, 2012[13]	To evaluate the prevalence of causes of SRA amongst HCW at a teaching hospital in Saudi Arabia	Cross-sectional	High income	3117 HCW	12%	N/A	Respiratory Digestive Musculoskeletal	- The cumulative total potential working days of all staff at the facility was not presented, which limits our understanding of the prevalence of SRA presented. - Not all SRA was recorded by the Employee Health Clinic which limits our understanding of the overall prevalence of SRA
Mollazadeh et al, 2018[7]	To evaluate the prevalence of causes of SRA	Cross-sectional	LMIC	690 HCW	1,1%	N/A	Respiratory Infectious Musculoskeletal	

	amongst HCW at a teaching hospital in Iran							
Nagata et al, 2018[18]	To evaluate the cost of absenteeism, presenteeism and medical expenses of pharmaceutical companies in Japan	Cross-sectional	High income	21 350 employees	N/A	US$520 Per employee	N/A	
Oche et al, 2018[10]	To evaluate the prevalence and causes of SRA amongst HCW at a teaching hospital in Nigeria	Cross-sectional	LMIC	242 HCW	1,5%	N/A	Malaria Hypertension Respiratory Digestive	- Systematic sampling methodology is not clearly defined potentially introducing selection bias. - All absenteeism, not SRA exclusively, was presented. - Data collected from self-reported questionnaires with no mechanism to verify the information which could have introduced recall bias
Rocha et al, 2019[16]	To evaluate the prevalence and causes of SRA amongst HCW at a teaching hospital in Brazil	Cross-sectional	LMIC	11 410 HCW	7,4%	N/A	Musculoskeletal Mental and behavioural	- The cumulative total potential working days of all staff at the facility was not presented, which limits our understanding of the prevalence of SRA presented.
Yamada et al, 2013[15]	To evaluate the prevalence of SRA amongst HCW and educators	Cross-sectional	LMIC	243 HCW	17%	N/A	N/A	- The cumulative total potential working days of all staff at the facility was not presented, which limits our understanding of the prevalence of SRA presented. - The study design did not allow the authors to evaluate how long the HCWs were absent from work. - It did not distinguish SRA and all other reasons for absenteeism. - It did not provide details about the healthcare facility nor the HCW themselves.

Purpose, risks and benefits

Purpose

To determine the prevalence, causes and costs of SRA in a teaching hospital in South Africa.

Risks

Privacy and confidentiality breach. A mitigation strategy of this is outlined in the privacy and confidentiality section below.

Benefits

Determining the prevalence, causes and costs of SRA at the hospital may drive strategic interventions to alleviate the burden. These interventions may improve staff morale/performance and service delivery and may reduce costs. Findings may also be generalizable other hospitals/clinical settings in the country and internationally.

Research questions

1. What is the prevalence of SRA at the hospital amongst HCWs?
2. What are the associated medical conditions of short- and long- term SRA at the hospital amongst HCWs?
3. What is the total direct cost of SRA at the hospital amongst HCWs?

Hypothesis

There is a high burden and cost of both short and long SRA at the teaching hospital.

Aims

1. To determine the prevalence of SRA at the hospital for the period Jan 2017- Dec 2019.
2. To determine the associated medical conditions of SRA at the hospital for the period Jan 2017- Dec 2019.
3. To determine the direct costs of SRA at the hospital for the period Jan 2017- Dec 2019.

Methodology

Study design

A period prevalence cross-sectional study.

Recruitment and enrolment

The study will only use secondary data as obtained from the hospital's human resources (HR) payroll information. As such, no recruitment/enrolment will be performed.

Research procedures and data collection methods

Secondary data analysis only. Data obtained directly from the payroll database as captured from the HR department at the hospital for the period 01 January 2017-31 December 2019.

Definitions

Health Care Workers

An expanded definition of HCW will be used for the purposes of this study. This definition includes all personnel that work at the hospital and includes all healthcare professionals, administrative staff and support staff. Only fulltime staff will be considered for the purposes of this study. Contract and agency staff will be excluded as they are governed by the policies of their own employer and their SRA data will not be accessible .

Sickness-related

Work absence due to sickness or injury will be coded from the payroll as any absenteeism captured due to sickness or injury. Short term is defined as ≤29 days and long term as >29 days.

Data management and analysis

Data will be analysed using Stata14 (StataCorp, USA).
Simple descriptive statistics will be used to summarize the demographic information of the study sample. The variables of interest are age, sex, pay class, occupation, position and department. The total (N) will be presented for each variable. The Shapiro Wilk test will be used to assess if each variable is normally distributed. If normally distributed, the mean and standard deviation will be used and if not normally distributed, the median and inter-quartile range will be used. The demographic information will be presented in Table 2.

Table 2: Demographic information

	n (%)	N; Mean/SD Median/IQR
Age-groups (categorical)		
Sex (m/f)		
Pay class (categorical)		
Occupation (categorical)		
Position (categorical)		
Department (categorical)		
TOTAL		

Prevalence

- Sickness Absence Rate (SAR) will be used to determine the prevalence of SRA. This metric is chosen because it provides a better representation of prevalence than the methodology used by Al-Shammari/Khawaja. It allows for comparison with other studies (Oche, Mollazadeh and Gorman).
    - SAR = (total number of SRA days in period / total potential working days in cycle period)*100
    - The variable "total number of working days in the period will be determined by totalling the variable "days absent due to illness". The "total number of potential working days" per period is determined by totalling the variable "total working days per month per employee" and multiplying by 24 (i.e. 24 months in the cycle period).
- Frequency Spells (FS) will be used and compared with the existing literature.
    - FS = number of SRA spells per cycle period / sample size
- Duration of Absence (DA) will be used and compared with the existing literature.
    - DA = SRA days in new spells per cycle period / number of new SRA spells per cycle period

Medical Conditions associated with SRA

- The medical conditions associated with SRA of all HCWs will be determined from the variable "reason for absence". This is aligned with International Classification of Disease 10 (ICD-10) codes. It will be further presented as the

causes of short- term SRA per cycle period and causes of long- term SRA per cycle period. The causes will be ranked from the most to least common. The top 10 most prevalent common conditions will be presented.

Cost

- The direct cost of SRA of all HCWs will be determined by multiplying the Total Cost of Employment (TCE) of the HCW in US$ per day per HCW (as determined by the HCWs pay class, variable named "SRA cost per day "), by the number of days lost due to sickness absenteeism per HCW per period. This will be presented as a sum amount and as a percentage of the total gross remuneration costs to the employer per period. Total cost of SRA = ∑ (SRA cost per day per employee X number of days lost due to SRA per employee per period). The results will be summarized in Table 3.

Table 3: Main study results

	n	%	Total potential work days	Total work days lost due to SRA	Total cost (US$)	SAR	FS	DA
Age (categorical)								
Sex (m/f)								
Pay class (categorical)								
Occupation (categorical)								
Position (categorical)								
Department (categorical)								
Total								

SAR: Sickness Absence Rate FS: Frequency Spells; DA: Duration of Absence

Missing data

It is assumed that a substantial proportion of short- term SRA will be missing or coded as "medical illness". This is as a result of the right of the employee to not

disclose the causes of short-term leave to their employer[9]. This group of causes will be coded as “cause not supplied”.

Ethics and Communication

Ethics approval

Ethics approval will be obtained from UCT Faculty of Health Sciences Human Research Ethics Committee (HREC).

Institutional approval will be obtained from the Chief Executive Officer (CEO) and the head of HR at the hospital as well as the Western Cape Department of Health.

Privacy and confidentiality

The dataset obtained from the hospital’s HR department will be devoid of all personal identifiers of the healthcare staff including their names, surnames, physical addresses identity number and persal numbers.

Data will be stored on a password protected computer. All communications with supervisors will be sent via password protected documents using secure UCT servers only.

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Part B: Journal Manuscript

Introduction

The Covid-19 pandemic has exposed the fragility of the healthcare system globally and in South Africa. Increasing absenteeism amongst Healthcare workers (HCWs) in this time due to mandatory quarantine or COVID-19-related sickness and isolation has brought the strain on human resources in the health sector sharply into focus. However, prior to the pandemic, there were already existing and longstanding problems related to sickness absenteeism due to limited human resources in the health sector. In the middle-income country of South Africa, the World Health Organization estimates that there are only 7 doctors per 10,000 people, which is below countries of similar socio-economic standing (Brazil 23, Thailand 9, Turkey 19 doctors per 10,000 people)[1].

The effects of a high burden of absenteeism amongst HCWs are potentially reduced health service delivery and increased costs[2-3]. The costs of workplace absenteeism across all sectors is increasing globally[4]. In South Africa, around US$ 1.2 billion is lost annually across all sectors due to absenteeism[5]. International literature suggests that the health sector is no different in experiencing high direct costs due to absenteeism. A South African perspective on sickness-related absenteeism (SRA) costs in the health sector is yet to be determined. Studies from similar settings demonstrated a burden of SRA of 1.1% and 1.5%[6-7], in contrast to a higher burden of 5.6% in a high- income setting[8]. SRA prevalence was higher amongst females than males[6, 8-9]. This finding should be interpreted within the context that female HCWs outnumbered male HCWs in all the studies. Professions with high physical demands (e.g. nursing) had the highest prevalence. Gorman et al correlated the higher SRA prevalence found in physically demanding professions with a higher SRA prevalence amongst lower wage earners, surmising that professions with a high manual work component will likely have lower wages[8]. Most studies found that SRA was more prevalent amongst older HCWs. The medical conditions associated with SRA are evaluated by both short and long-term SRA. Short term SRA was associated with acute infectious diseases of respiratory, digestive system or other non-specific infections, and Musculoskeletal conditions[6,7,9,10]. Long term SRA was most associated with Musculoskeletal conditions and mental health problems[10]. The costs of SRA may be direct or indirect. The direct human capital cost of SRA is the total time missed due to SRA, multiplied by the HCWs Total Cost of Employment (TCE). When HCWs are absent within the bounds of their contract,

the direct SRA costs are carried by the employer as the HCW will receive their full remuneration. To date, there are no studies that evaluated the cost of SRA of South African HCWs or in similar LMICs. Within a high-income setting, the total direct cost of SRA of HCWs was estimated to be CDN$1 428 (US$ 1 134, Morningstar end of day prices as of 21/03/2022) per employee per year[8]. Nagata et al evaluated the costs of SRA in 4 pharmaceutical companies in Japan and found an average cost of SRA of US$520 per employee per year[11]. The difference in findings can be explained by the variable settings, variable cost of healthcare and associated medical conditions.

The purpose of this study was to determine the burden and costs of SRA in a tertiary hospital in South Africa. The three primary aims were 1) to determine the prevalence of SRA 2) to determine the associated medical conditions of SRA and 3) to determine the direct costs (US$) of SRA at the hospital for the period January 2017-December 2019.

This unique study may empower hospital policy-makers to quantity the problem and drive strategic interventions for the prevention of SRA in the workplace. The findings may be of relevance to other health environments in LMIC settings.

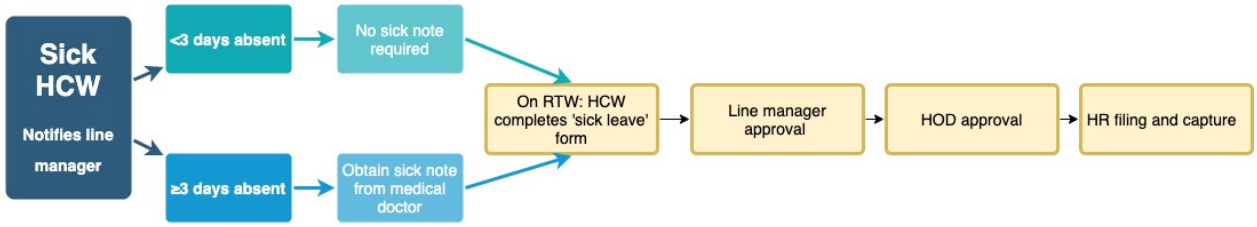
Methodology

The study setting was performed in a large tertiary hospital situated in South Africa. The hospital has a total of 3,543 staff members, two thirds of whom are healthcare professionals and the remaining are administrative and support staff.

There are several policies that govern sick leave allocation and utilization in the public health sector. In terms of the Basic Conditions of Employment Act (BCEA), paid sick leave is a contractual right of all employees at the hospital[12]. This entitles them to 36 sick leave days granted over a 3-year cycle. Should an employee exhaust the 36- day period, they may apply for incapacity leave in accordance with the Policy and Procedure on Incapacity and Ill-Health Retirement (PILIR)[13]. This is granted on a case-by-case basis following evaluation by a health risk manager and requires evaluation of the medical reports submitted by the employee's treating medical doctor. There is no limit on sick leave, but a determination of permanent impairment and possible ill-health retirement is considered after a 2-year period of continuous or prolonged absence from work.

The process of applying for sick leave is as follows (figure 1): the HCW contacts their line manager telephonically and indicates that he/she is not well and will request sick leave. A medical certificate is required after three or more sick leave days are taken. On return to work, the HCW completes a leave form indicating 'sick leave'. The sick leave form is then sent to the line manager and head of department for approval and signature. The sick leave form is handed over to the HR department for capturing on a digital platform. The hard copy is sent for filing.

Figure 1: Sick leave process



RTW: Return to work; HOD: Head of department

A period prevalence cross-sectional study design was used. The SRA data was obtained from the hospital's human resources (HR) department payroll dataset of all HCW's between 1st January 2017 – 31st December 2019, covering a three-year sick leave cycle. The study definition of HCW was all personnel that work at the hospital and includes all healthcare professionals, administrative staff and support

staff. Only fulltime staff were considered for the purposes of this study. Contract and agency staff were excluded as they are governed by policies of their employer and their SRA data were not accessible. “Sickness-related” was defined as work absence due to sickness or injury as noted on the HR payroll dataset as any absenteeism captured due to sickness or injury. Short term SRA was defined as ≤29 days and long term as >29 days.

Data cleaning and analysis was performed with Stata14 (StataCorp, USA). All personal identifiers were removed and unique identifiers were developed from the hospital’s employee number (the latter was excluded from the analysis). Duplicate entries were removed and the derived variables of relevance to the analysis were calculated as described below. Variables were assessed for normal distribution using the Shapiro Wilk test. Where normally distributed, the mean and standard deviation were used and where not normally distributed, the median and inter-quartile range were used.

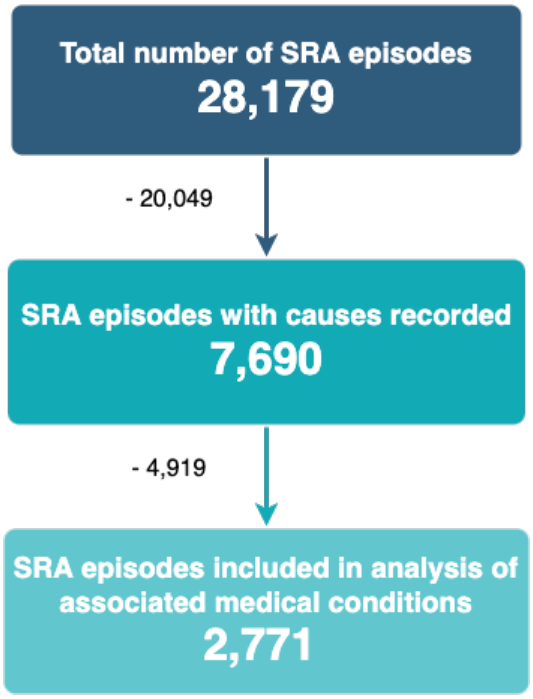
Prevalence was determined by calculating the Sickness Absence Rate (SAR) as described in similar studies[6-8]. SAR = (total number of SRA days per study period / total potential working days per study period)*100. The “total potential working days per study period” was estimated as 679 days over the three year period. This was calculated as total days (1095) – (weekend days (313) + annual leave days (63) + public holidays (40)). Commuted overtime for doctors was not considered as part of the study due to the inability to access or reliably estimate this information.

The frequency of SRA was determined by the Frequency Spells (FS). FS = number of SRA spells per cycle period /size of population. The average duration of SRA was determined by the Duration of Absence (DA). DA = SRA days in new spells per cycle period / number of new SRA spells per cycle period.

The direct cost of SRA was determined by assessing the Total Cost of Employment (TCE) per day per duration of SRA episode of all employees. The daily TCE was therefore used as a proxy for the opportunity cost of a lost day of work due to SRA. Indirect/friction costs were not considered in the methodology of this study. The total direct SRA cost per person was calculated by the total direct SRA cost over the study period / size of the population that required at least one SRA spell. The average direct SRA cost per day was determined by assessing the total direct SRA cost / number of SRA days. This allowed a consideration of both the TCE and average length of time per SRA spell when assessing the cost.

The associated medical conditions of SRA were determined from the HR payroll dataset. The conditions were grouped into categories per body systems as described by the 10th International Classification of Diseases (ICD-10). The causes were classified by duration and ranked by their prevalence. Of the 28,179 SRA entries from the dataset, 20,519 did not record a reason for their absence. The remaining 7,690 entries were cleaned and entries with reasons not amenable to analysis (for example "diagnosis illegible" or "diagnosis not stated") were removed. The remaining 2,771 episodes were assessed and included in the analysis of the associated medical conditions (figure 2).

Figure 2: Process of including SRA episodes in the analysis of associated medical conditions.



Results

Table one summarises the demographic information of the study. The hospital employed 3,543 fulltime HCW's during the period under study. This totalled 2,405,697 potential working days. The majority of staff in the hospital were women (71.25%). Of the clinical staff (65.54%), nursing staff (40,33%) and doctors (16,77%) comprised the largest of the staff complement. The TCE of all HCWs over the study period was US$174,526,556.93 (US$58,175,518.98 per annum) (data not shown). Half of the employees earned less than US$16,750 per annum and only a minority more than US$50,250 per annum (14.56%).

Table 1: Demographic information and potential work days for staff employed at the hospital (n=3,543)

	N	%	Total potential work days
Age			
– 18 - 30	648	18.29%	439,992
– 31 - 45	1,406	39.68%	954,674
– 46 - 60	1,393	39.32%	945,847
– >60	96	2.71%	65,184
Sex			
– Male	1,001	28.25%	679,679
– Female	2,542	71.75%	1,726,018
Occupation			
Clinical	2,322	65.54%	1,576,638
– Allied Health professionals	58	1.64%	39,382
– Doctors	594	16.77%	403,326
– Nurses	1,429	40.33%	970,291
– Pharmacists	64	1.81%	43,456
– Psychologists	6	0.17%	4,074
– Radiographers	97	2.74%	65,863
– Social Workers	20	0.56%	13,580

– Technologists	54	1.52%	36,666
Non-clinical	1,221	34.46%	829,059
TCE			
– < ZAR250,000 (US$16,750) per annum	1,772	50.01%	1,203,188
– ZAR250,000 - ZAR500,000 (US$16,750 - US$33,500) per annum	907	25.60%	615,853
– ZAR500,000 - ZAR750,000 (US$33,500 - US$50,250) per annum	348	9.82%	236,292
– >ZAR750,000 (US$50,250) per annum	516	14.56%	350,364
Total Staff complement	3,543	100.00%	2,405,697

TCE = total cost to employer

Table two summarises the SRA prevalence and costs of the study. Of the 3,543 fulltime HCW's employed during the period under study, 2,748 required at least one day of SRA. This totalled 1,865,892 total potential working days, 28,179 SRA spells and 63,378 days lost due to SRA.

Prevalence of SRA

We assessed and compared the demographic information of the entire population (table 1) with those who took at least one day of SRA (table 2). Overall consistency between the two populations was shown. The median age of those who took at least one day of SRA was 41 (IQR 32 – 50) compared with 43 (IQR 33 – 50) in the total population. The men/women ratio was comparable (men 25.15% and 28.25%, women 74,85% and 71.75% respectively) as well as the occupational type (clinical 61.79% and 65.54%, 39.52% and 34.46% respectively.

The vast majority of SRA spells were of short duration (99.13%). The overall SRA prevalence was determined as an SAR of 2.63%, a DA of 2.25 days per spell and an FS of 7.95 spells per HCW over the study period. Lower SRA prevalence was found amongst people under 30 years old (SAR 2.04%, FS 6.93, DA 2.00) compared with older groups. However, the lowest prevalence was noted amongst those over the age of 60 (SAR 0.9%, FS 2.63, DA 2.33). Higher SAR (2.84%) and more frequent spells (8.45) were noted in women employees compared with men (SAR 2.12%, FS 6.7).

Assessing the prevalence by occupation shows higher SAR amongst non-clinical staff (3.29%) compared to clinical staff (2.29%) staff. Nursing staff, representing the largest cohort (44,4%), had a higher SAR (2.95%), higher FS (8.55) and higher DA (2.34) in comparison to other staff. In contrast, doctors had both lower SAR (0.39%) and lower FS (0.97) but had the highest DA (2.73) as compared with other professions. The highest SAR (3.58%) and highest DA (11.92) was found amongst pharmacists. There was a direct relationship between SRA prevalence and earning capacity. Those earning less than R250 000 PA had both the highest SAR (3.3%) and DA (10.18) as compared with other categories of TCE.

Cost of SRA

The total direct cost of SRA of all employees, as proxied by TCE, was US$5,105,061.78 for the study period and US$1,701,687.26 per annum. The average direct SRA cost per day over the study period was US$80.55. A higher mean cost per day was found amongst clinical staff (US$103.67) compared to non-clinical staff (US$49.95). Among the clinical staff, the cost was more than 3 times higher amongst doctors (US$316.89) compared to the average. It was also more than 3 times higher amongst those employees with a TCE of more than US$50,250 PA (US$292.723) compared with the average. Pharmacists had the highest total direct SRA cost per person (US$4,735.11) over the study period which was more than double the average (US$1,857.74). Long SRA only represented 0.87% of the burden of SRA in the study, but resulted in 7,82% of the total SRA cost (US$315,817.14) and a significantly higher average direct cost per episode (US$4,697.00).

Associated medical conditions of SRA

The top associated medical conditions of SRA in the study are summarised in figure 3. The demographic information of the SRA records incorporated in the analysis of the associated medical conditions demonstrated was assessed. There was 1,141 staff members included with a median age of 42 (IQR 33 – 51), female/male ratio of 78%/22% and occupational split of 58% clinical and 42% non-clinical. Musculoskeletal and connective tissue diseases were the most common causes of SRA in all categories, followed by respiratory and digestive system conditions in all categories with the exception of Long SRA. Short duration SRA, comprising the vast majority of SRA episodes, consisting of acute conditions of the musculoskeletal system such as mechanical lower back pain and other acute joint pains. Both respiratory and digestive system disorders comprised mostly acute

infectious diseases such as acute upper respiratory tract infection and acute gastroenteritis respectively. Nervous system disorders were mostly acute episodes of headaches and the mental and behavioural disorders were primarily related to

Table 2: SRA Prevalence and cost between 2017 – 2019 for all staff who took sickness absence during this period (n= 2,748)

	N	%	Prevalence					Cost (US$)			
			Total SRA spells	Total SRA days	SAR	FS	DA	TCE over study period	Total direct SRA cost	Total direct SRA cost per person	Average direct SRA cost per day
Age, median [IQR] 41 [32 - 50]											
– 18 - 30	508	18.49%	4,491	8,965	2.04%	6.93	2.00	28,259,537.51	685,073.37	1,348.57	76.42
– 31 - 45	1,094	39.81%	11,951	26,697	2.80%	8.50	2.23	73,044,089.23	2,176,847.25	1,989.81	81.54
– 46 - 60	1,130	41.12%	11,485	27,130	2.87%	8.24	2.36	71,877,586.33	2,194,799.05	1,947.47	80.90
– >60	16	0.58%	252	586	0.90%	2.63	2.33	1,345,338.83	48,342.22	2,544.33	82.50
Sex											
– Male	691	25.15%	6,711	14,409	2.12%	6.70	2.15	45,211,296.22	1,056,277.15	1,528.62	73.31
– Female	2,057	74.85%	21,468	48,969	2.84%	8.45	2.28	129,315,255.68	4,048,784.74	1,968.30	82.68
Occupation											
Clinical	1,698	61.79%	15,576	36,100	2.29%	6.71	2.32	136,745,146.31	3,742,570.90	2,204.11	103.67
– Allied Health professionals	35	1.27%	388	703	1.79%	6.69	1.81	3,030,958.40	92,941.24	2,655.46	132.21
– Doctors	192	6.99%	575	1,569	0.39%	0.97	2.73	42,380,088.41	497,203.51	2,589.60	316.89
– Nurses	1,220	44.40%	12,219	28,604	2.95%	8.55	2.34	69,032,262.49	2,366,903.93	1,940.09	82.75
– Pharmacists	56	2.04%	763	1,554	3.58%	11.92	2.04	6,657,971.24	265,166.24	4,735.11	170.63
– Psychologists	3	0.11%	21	32	0.79%	3.50	1.52	623,391.25	10,399.97	3,466.66	325.00
– Radiographers	78	2.84%	857	1,948	2.96%	8.84	2.27	7,220,923.19	276,032.03	3,538.87	141.70
– Social Workers	20	0.73%	144	320	2.36%	7.20	2.22	1,534,056.72	33,490.47	1,674.52	104.66
– Technologists	58	2.11%	609	1,370	3.74%	11.28	2.25	6,265,494.62	200,433.50	3,455.75	146.30
Non-clinical	1,086	39.52%	12,603	27,278	3.29%	10.32	2.16	37,781,405.59	1,362,491.00	1,254.60	49.95
TCE, median [IQR] US$12,268.36 [10,262.92–25,343.18]											
– < R250,000 per annum	1,598	58.15%	18,042	39,759	3.30%	10.18	2.20	52,096,069.22	1,885,855.83	1,180.14	47.43
– R250,000-R500,000 per annum	708	25.76%	7,027	15,634	2.54%	7.75	2.22	48,230,989.57	1,571,963.38	2,220.29	100.55
– R500,000 - R750,000 per annum	200	7.28%	2,030	5,333	2.26%	5.83	2.63	22,053,581.71	872,254.91	4,361.27	163.56
– >R750,000 per annum	242	8.81%	1,080	2,652	0.76%	2.09	2.46	52,145,911.40	774,987.66	3,202.43	292.23
Total	2,748	100%	28,179	63,378	2.63%	7.95	2.25	174,526,556.93	5,105,061.78	1,857.74	80.55

SRA: Sickness-related absenteeism, TCE: Total cost of employment, SAR: Sickness absence rate, FS: Frequency spells, DA: Duration of absence, IQR: Inter-quartile range, Costs in US$

Figure 3: Top 5 causes of SRA disaggregated by duration of absence and demographic factors in those for whom a medical diagnosis was provided in support of sickness absence (n= 2,771)

SRA: Sickness-related Absenteeism

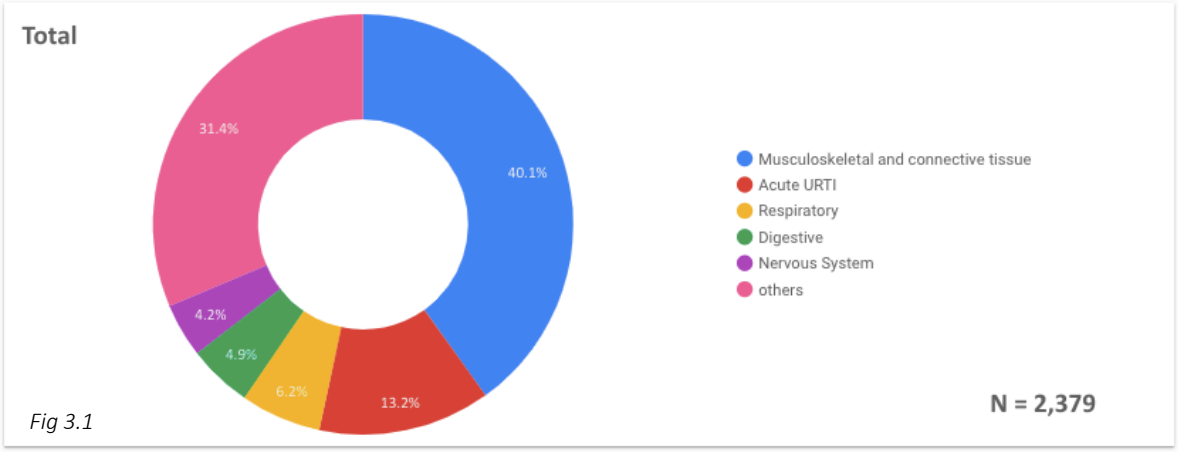


Fig 3.1

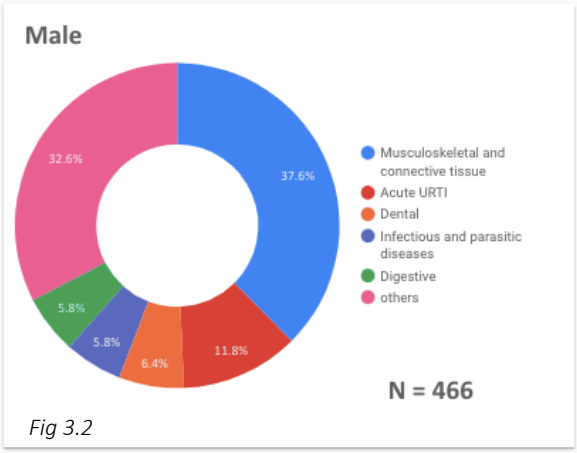


Fig 3.2

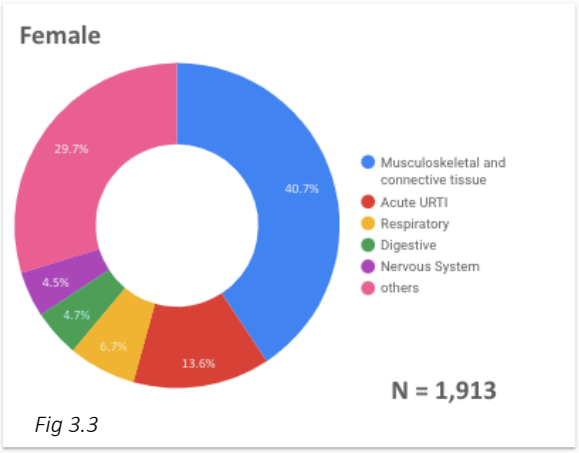


Fig 3.3

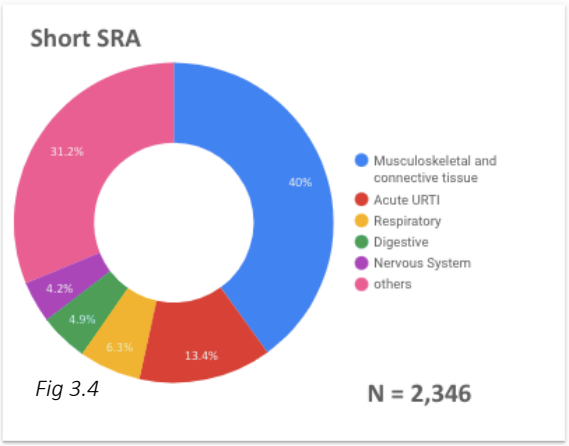


Fig 3.4

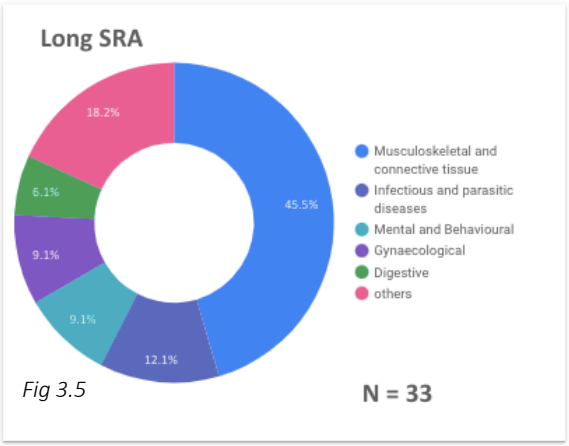


Fig 3.5

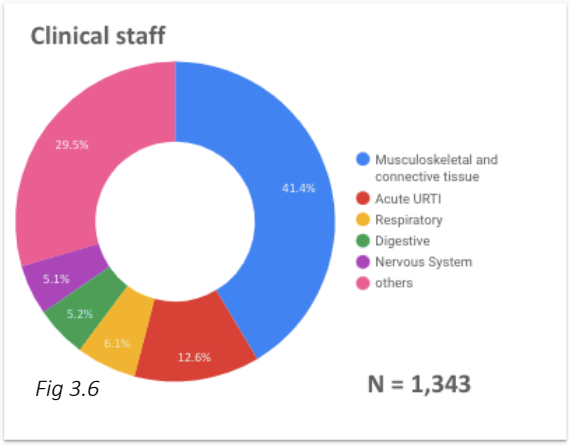


Fig 3.6

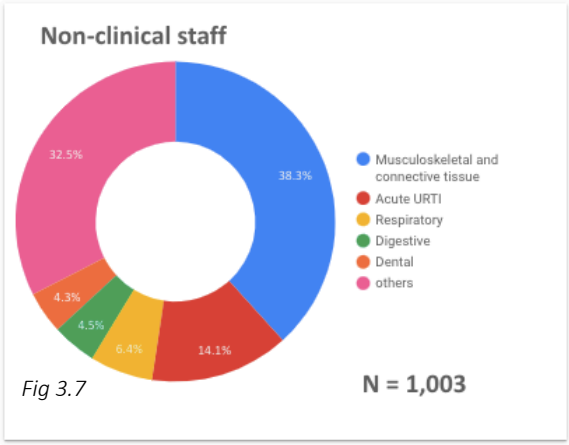


Fig 3.7

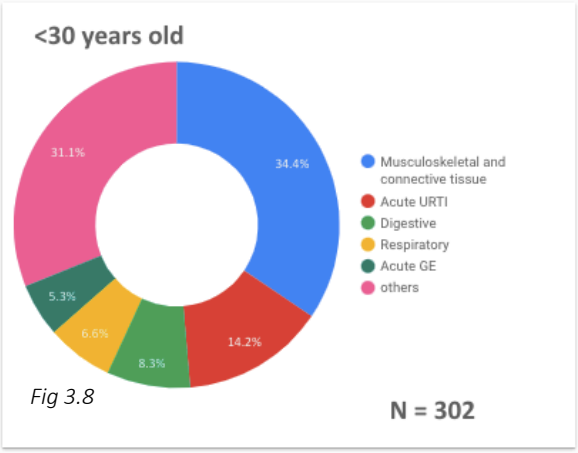


Fig 3.8

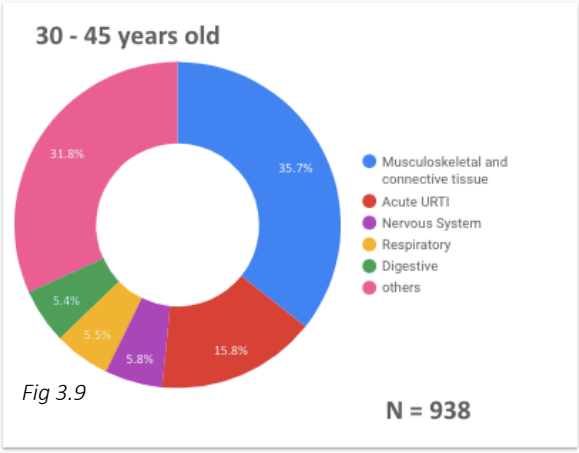


Fig 3.9

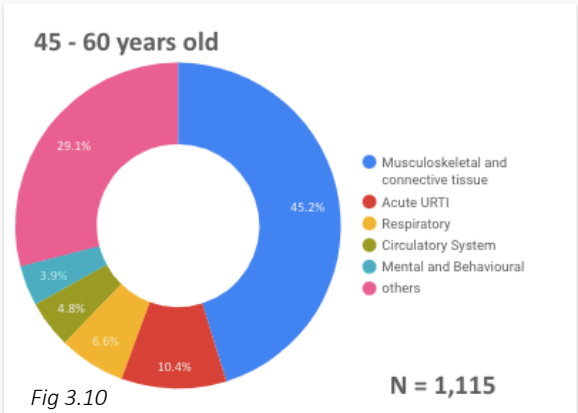


Fig 3.10

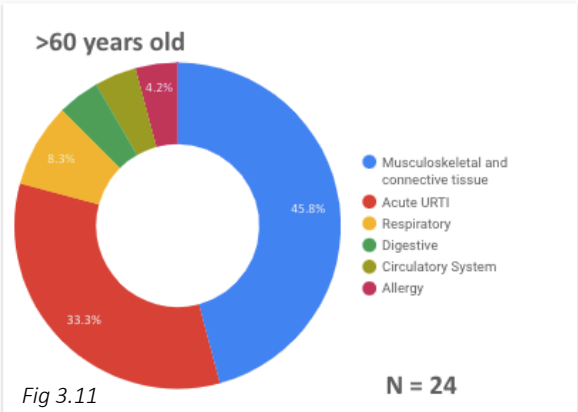


Fig 3.11

3.1: Total; 3.2&3.3: Sex; 3.4 & 3.5: SRA duration; 3.6 & 3.7: Occupation; 3.8 – 3.11: Age

"Others" – Subcutaneous conditions, Eye and adnexa, Urological, Mastoid Process, Pregnancy, Endocrine, Neoplasms, Blood disorders

Discussion

Main findings

Prevalence of SRA

We have shown a higher overall burden of SRA when compared with studies in similar settings[6,7]. The reasons for this include the differences in population size, differences in the definition of HCWs used and the longer study period in this study. There was generally a direct relationship with age and burden of SRA. However, the older than 60 years age category had the lowest prevalence of SRA in contrast to other studies. The relatively small population size of the older than 60 years group (n = 96) compared with other age categories in the study and the mostly senior roles that they occupied that were less physically demanding (e.g. nursing matrons and managers) might explain this. Furthermore, the "healthy worker survivor effect" may apply where older staff members still under employment are likely to be healthier and require less SRA compared with those that left employment at an earlier stage due to ill health[14]. Women were found to have a higher burden of SRA compared with men, in-keeping with studies in similar settings[6,8,9]. Occupations that were physically demanding were found to have higher prevalence of SRA (nurses, pharmacists). This could also explain the higher burden amongst non-clinical staff that comprise of manual labour-intensive roles such as security officers and cleaners in addition to the administrative personnel. Following this conclusion, the higher burden of SRA amongst lower earners who are more likely to have physically demanding occupations might be explained, supported by the findings of a large cohort study in a high-income setting[8]. Doctors were less likely to require SRA, but their average duration of absence was the highest. This finding could mean that doctors are not taking SRA when required and choose to work while sick more than other HCWs – also defined as "presenteeism", known to be highly prevalent amongst HCWs[19]. Furthermore, it could also mean when they do require SRA, they may have more severe or advanced stage disease as suggested by their average longer period of SRA.

Costs of SRA

The high SRA costs found over the study period were in keeping with other studies[8]. The direct SRA costs represented 2.93% of the TCE of all employees over the same period. SRA therefore presents a significant opportunity cost to the hospital in terms of lost productivity . The average SRA cost per employee per

annum was US$618.14 which was lower than the US$1,193.66 found in a Canadian HCW study and lower than but closer to the US$524.85 found by a study of Japanese pharmaceutical employees[8,11]. This differences could be explained by the higher average TCE of all employees and prevalence of SRA in the Canadian HCW study and industry and setting differences in TCE in the Japanese study.

Associated medical conditions of SRA

Conditions of the Musculoskeletal and connective tissue system were the most prevalent associated medical conditions in all categories, aligned with studies in other settings[6,7,9,10]. This finding is unsurprising considering that nursing, which is a physically demanding occupation, represented the largest occupational sector in the study. Additionally, many of the other occupations may have high physical demands which may place the employee at risk of developing or exacerbating musculoskeletal and connective tissue system conditions. Acute infectious diseases of the respiratory and digestive tract were also commonly found, which is aligned with findings from other studies[6,7,9,10]. The hospital environment and occupational exposure to biological hazards may place the employee at increased risk of developing acute infectious illnesses. The prevalence of mental health conditions did not represent a significant burden of SRA in the study. This is not in keeping with the increasing burden of mental health conditions amongst HCWs described by Khawaja et al[9]. The reasons for this could be due to the limitations of understanding the associated medical conditions in this study as described below. It could also be as a result of mental health conditions not detected or labelled as physical conditions only based on the accompanying somatic complaints or non-disclosure of a mental health diagnosis due to societal stigma associated with mental health disorders[15-17]. In contrast, studies that actively screened for mental health conditions found a higher burden of mental health conditions[18].

Strengths and limitations

To our knowledge, this is the first study to evaluate the prevalence, costs and associated medical conditions of SRA amongst HCWs in South Africa. It is also the largest study within a LMIC context and the first to evaluate three distinct metrics in determining the burden of SRA (i.e. prevalence, cost and associated medical conditions).

The limitations of this study are that the burden and costs of presenteeism and the indirect/frictional costs of SRA were not considered. Additionally, the costing information of doctors were not comprehensive considering commuted overtime (COT) was not included in the methodology, owing to the inability to obtain reliable information in this regard. This would have resulted in an underestimate of costs.

A further limitation was the 25,408 SRA episodes which did not have a medical condition captured or condition that was not amenable to analysis, significantly limiting the ability to understand the associated medical conditions driving absenteeism. This was a limitation of the study design considering medical professionals are not compelled to disclose medical conditions as proof of incapacity to an employer. Lastly, the study period was prior to the Covid-19 pandemic. Had the study included SRA data from the pandemic, it would likely have significantly changed the results because of the mandatory Covid-19 quarantine/isolation periods and likely increased SRA of HCWs during this time.

Conclusion

The higher burden of SRA found in this study compared with studies in other LMIC settings creates pause for reflection on the reasons and should prompt further research. It stands to reason that a high burden of SRA amongst HCW will affect health service delivery. This might further exacerbate the quality of healthcare people receive, in a country which already experiences significant healthcare challenges. The overall direct SRA cost is not insignificant when considered as a line item on policy-makers annual budget planning. It should provide impetus for risk reduction measures in the workplace. These measures should be guided by prevention efforts as musculoskeletal and connective tissue disorders are sthe most prevalent conditions in all groups. The higher prevalence of SRA amongst non-clinical staff justifies the decision to include this population in the study, considering they were historically excluded in the definition of a HCW. Although these individuals do not perform clinical roles, they experience the same hazardous exposures as the clinical staff by virtue of working in a hospital environment. Further research is required to identify if risk factors in the workplace are causally-related and/or contributory causes to the development of these conditions. The high burden of acute upper respiratory tract infections should also prompt further research into annual influenza vaccine coverage and the estimated impact thereof on the population. In the context of Covid-19, preventive measures such as Covid vaccine uptake amongst HCWs should also be evaluated.

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Part C: Appendices

Appendix A: Acknowledgements

Associated Professor Shahieda Adams
Primary internal supervisor.
Provided guidance on all aspects of the thesis ideation, design, analysis, write-up and submission.
Provided expert insights into occupational health related aspects of the thesis.

Associated Professor Susan Cleary
Secondary internal supervisor
Provided guidance on all aspects of the thesis ideation, design, analysis and write-up and submission.
Provided expert insights into health economics related aspects of the thesis.

Appendix B: Data sheet

Variable name	Unit	Description	Purpose of variable
Demographic variables			
Unique identifier	-	Identifier derived from persal number.	To determine the SRA frequency per employee (i.e. frequency spells - FS) To determine the Frequency persons (FP)
Date of birth	-		To determine the age distribution of SRA
Sex	-	M/F	To determine the sex distribution of SRA
Occupation	-	Occupation within the hospital E.g. Nurse, Doctor, Radiologist, Porter etc	To determine the occupational distribution of SRA
Position	-	Position held within the hospital E.g. Consultant, Matron, Manager etc	To determine the position distribution of SRA
Pay class	-		To determine the total gross remuneration distribution of SRA
Department	-	Department within the hospital E.g. Paediatrics, Surgery, Medicine etc	To determine the departmental distribution of SRA
Working days per month	Days	Total number of working days per month per employee	To determine the prevalence of SRA
SRA variables			
Type of absence	-	SRA, family responsibility leave, annual leave etc	To determine the burden and cost of SRA relative to all types of leave
Reason for absence	-	SRA causes will be coded by using ICD-10	To determine the causes of SRA
SRA Start date	-		To determine the duration of SRA
SRA End date	-		To determine the duration of SRA
Calculated variables			
Age	Years	Calculated at the end of study period (31/12/2019)	To determine the age distribution of SRA
Total gross remuneration	US	Total Gross remuneration per annum. Determined from pay class	To determine the total gross remuneration distribution of SRA
SRA frequency per employee	-	Number of SRA spells per employee	To determine the SRA frequency per employee (i.e. frequency spells - FS)

Duration of SRA	Days	SRA End date - SRA Start date	To determine the Duration of Absence (DA) and Sickness Absence Rate (SAR)
SRA cost per day	US$	Total gross remuneration package per annum / 365	To determine the Total Cost of SRA

Appendix C: Instructions for the target journal

Journal identified: The Journal of Health Services Research and Policy

Journal instructions:

- Language: English
- Formatting: A4, size 12 font, double-spacing, margins no less than 20mm
- Total word count: 3 500 words, up to 30 references, up to two figures and/or tables and boxes
- Reference style: Vancouver