



## Associated Factors of Occupational Health and Safety Outcomes among Sanitary Workers: Systematic Review

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### ABSTRACT

**Background:** As a result of working conditions, various types of factors contribute to the development of occupational related injuries and musculoskeletal disorders among sanitary employees, which must be identified in order to predict problems.

**Methods:** PubMed, Medline, Embase, and Lilacs databases were used from 2000 to April 2022. Searched strategies: Occupational \*OR Job \*OR work AND occupational injuries OR musculoskeletal disorder AND associated factors (Socio-demographic character \*OR Behavioral factors \*OR institution factors \*OR work pattern) AND sanitary workers (waste collectors and emptier \*OR street sweepers \*OR sewage workers \*OR health facilities) AND countries (developed \*OR Developing) AND cross-sectional studies.

**Results:** From total of 78 eligible, 13 studies on were included. The majority of the 4564 sanitary personnel, 3844 (84%) were solid waste collectors. The rest are street sweepers 10% (450) and cleaners 6% (270). Age (OR: 22.57; CI 95%: 7.29-69.88); education (OR: 2.22; CI 95%: 1.22-4.00); and work experience (OR: 1.92; CI 95% 1.11-3.31) were the significant predictors for the prevalence of occupational injuries. Smoking cigarettes (OR: 2.6, CI 95%: 1.55-4.34); sleeping disturbance (OR: 2.57, CI 95%: 1.48-4.47); eating/smoking/drinking at work (OR: 3.85, CI 95%: 1.34-11.06); lack of personal protective equipment (OR: 2.62; 1.48-4.63) also the other predictors. Sociodemographic characteristics that influence the development of musculoskeletal illnesses include education (OR: 6.73; CI 95%: 1.92-23.51), age (OR: 7.56; CI 95%: 2.18-26.18), and work experience (OR: 10.79; CI 95%: 3.49-33.38). Behavioral characteristics include cigarette smoking (OR: 0.14; CI 95%: 0.03-0.64); and work satisfaction (OR: 11.43; CI 95%: 2.04-64.08). Time pressure (OR: 3.25; CI 95%: 1.08-9.77); working more than 8 hours (OR: 3.5; CI 95%: 1.543-8.204) are occupational safety variables. Working for more than 2 hours (OR: 8; CI 95%: 2.25; 28.85) and uncomfortable posture (OR: 15.7; CI 95%: 6.47-38.18) are risk factors.

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**Conclusion:** The review evidence has found that socio demographic indicators, occupational safety with work pattern features, and behavioral factors all significant contributed for the occupational health and safety outcomes among sanitation workers.

**Keywords:** Associated factors; Musculoskeletal disorders; Occupational injuries; Sanitary workers

**Abbreviations:** ILO: International Labor Organization; OHS: Occupational Health and Safety; ORI: Occupational Related Injuries; PRISMA: Preferred Reporting Items for Systematic Reviews; SS: Street Sweepers; STW: Sewage and waste Treatment Workers; SWCs: Municipality Solid Waste Collectors; WHO: World Health Organization

## INTRODUCTION

Sanitation workers encompasses a vast line of services, the number of sanitation workers globally is difficult to estimate because they often have multiple jobs or are categorized with other sectors like solid waste and healthcare facility management. However, they are facing many challenges like issues related to their health and safety problems such as musculoskeletal disorders, injuries, respiratory problems, gastro intestinal problems and infectious diseases, dermatitis, rhinitis, hepatitis B and C, parasitic diseases, eating disorders and sleep, depression, neurosis, allergic and toxic reactions, HIV, acute or chronic infections. As the result, millions of sanitation workers across the world particularly in low income countries and middle-income countries are forced to work in conditions that endanger their health and lives, and violate their dignity and human rights [1-4].

The review only limited to self-report from occupational related Injuries and musculoskeletal disorders from the result of occupational health and safety outcomes.

**Occupational related injuries:** self-reported injuries that included physical harm caused by accident or disease associated with the occupational exposure. Includes self-reported, clinically confirmed or others recorded morbidity or mortality, including but not limited to punctures, abrasion, laceration wounds, cuts, or blunt force trauma.

**While, musculoskeletal disorders:** Self-reported MSDs, when evidence obtained from self-reported and nine body regions of sanitary workers such as neck, shoulder, upper back, elbow, lower back, wrist/hand, hips/thighs/, knee and ankle/feet trauma [5].

A lot of studies found that safety measures, lack of institutional support, lack of education, high or low of experience sanitary workers, behavioral factors, lack of supervisor, unregulated or unenforced environmental and labor protections, lack of pre-job training and lack of are the most common associated factors for occurrence of these outcomes [6].

**Moreover, there was poor social recognition for this group:** As evidence indicated professional cleaning is often considered as unskilled extra work that everyone knows how to do. The fact that cleaning receives poor social recognition is a factor affecting negatively the cleaners' motivation and identification with the work. Even some sanitary workers

themselves are of the opinion that cleaning is a job that does not require special qualifications and that anyone can do it [7,8]. Low appreciation of the job tends to harm workers' satisfaction and lead to stress, with subsequent negative effects on mental and physical health [9].

In this review, the associated factors are limited to occupational related injuries and musculoskeletal disorders. The occurrence of occupational related injuries could be due to difference of gender marital status and family size. The other factors are work experiences training [10-16]. The other factors are due to formal education and majority of sanitary workers are illiterate and low income. Moreover, environment satisfaction, job satisfaction, sleeping disorder and job stress are also associated factors for occurrence of occupational related injuries. In addition, alcohol consumption, khat chewing and cigarette smoking are also other associated factors. In this review institution factors could trigger an employee's action that could lead directly or indirectly to an occurrence of an accident and injury due to less attention of institutions, weak IPC practice, lack supervision, work overload and lack of follow up [17-20].

Moreover, there were a lot of associated factors for development of musculoskeletal disorders among sanitary workers. As studies indicating experiences were significantly more likely to suffer from MSDs. From these evidences we learnt, as work experience increases, the development of MSDs also increases among sanitary workers. Moreover, the respondents over the age of forty years old were 5.41 times more likely to developed MSDs of the knee as compared to less than thirty years old. Therefore, increment of age leads to development of MSDs among sanitary workers. Furthermore, Job satisfactions: It also found to be significantly correlated as the sanitary workers who were not satisfied with their job were more likely to have suffered from the MSDs. Moreover, those had time pressure, feeling exhausted, and working hours more likely to develop MSDs as compared to those didn't have. The study revealed that those working in high slum concentration areas and those came far from working place were more likely to get MSDs as compared with those working in the low slum concentration areas. While, distance and length of the broom, there was a positive association with weight of broom, and total weight of broom and dustpan. Those working in awkward posture and sustaining position more than two hours were more likely to develop MSDs as compared to the counterpart. Furthermore, the study indicated poor mental health status were significantly

more likely to report MSDs for upper back and shoulders, respectively as compared to those had good mental health. Therefore, the aim of this review was to identify associated factors for occurrence of occupational health and safety outcomes and intensify the problems to the world for better solution. Finally, this review will attempt to publication for further scholars and policy makers in order to sustain the sanitary workers.

## MATERIALS AND METHODS

The review methods used Preferred Reporting Items for Systematic Reviews (PRISMA) updated criteria adopted from Page, et al., used.

### Population Group

Sanitary workers included solid waste collectors/pickers/emptier, health care facility cleaners, sewage workers waste water treatment workers, street sweepers.

### Study Eligibility Criteria

**Inclusion criteria:** Studies that were published in English, cross sectional studies design and ORI and MSDs as outcomes on specified sanitary workers were included.

**Exclusion criteria:** Studies that were published in French, and Spanish were excluded. Office cleaners, hotel and restaurant cleaners, quasi-experiment, case control studies and cohort studies were excluded.

### Study Design and Setting

**Review was searched from data bases:** Medline, PubMed, Embase, LILACS databases; Google Scholar, and other reported data from 2010 to April 2022.

### Searching Strategies

A search strategy sample from the online databases as: Occupational \*OR Job \*OR work AND occupational injuries OR musculoskeletal disorder AND associated factors (Socio-demographic character \*OR behavioral factors \*OR institution factors \*OR work pattern) AND sanitary workers (waste collectors and emptier \*OR street sweepers \*OR sewage workers \*OR health facilities] AND countries (developed \*OR developing) AND cross-sectional studies.

### Data Screening

Titles and abstracts returned by the search were screened by using Microsoft Excel and full copies of titles and abstracts were obtained. Then finally, the results from the databases were managed and duplicates were removed in the reference management software, Zotero.

### Data Extraction

Data was extracted using a prescribed extraction form developed in a Microsoft Excel spreadsheet.

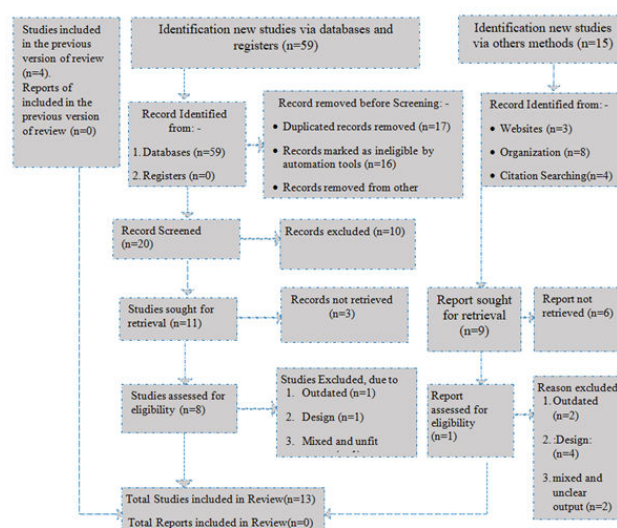
## Data Synthesis

The studies published pertaining to occupational outcomes was synthesized according type of their outcomes. Results for other outcomes are tabulated and described narratively.

## RESULTS

### Selection Studies

The databases and other collected data and reports yielded a total of 78 studies. Three of these studies were included in the previous version of the review, 59 were new research *via* databases and registers, and 15 were new studies *via* other approaches. (Figure 1). As a consequence, thirteen (13) researches on the prevalence of occupational injuries and musculoskeletal disorders were included.



**Figure 1:** Flow diagram for systematic reviews adopted from PRISMA 2020.

### Countries Reviewed

Ten of the thirteen studies were gathered from low income countries, while the remaining three were gained from industrialized countries. That means that more than three quarters of the data came from articles published by poor countries.

### Studied Population

From total of reviewed sanitary workers (4564), majority of them 3844 (84%) were solid waste collectors. The remaining 450 (100% and 270 (6%) were street sweepers and cleaners, respectively (Figure 2).

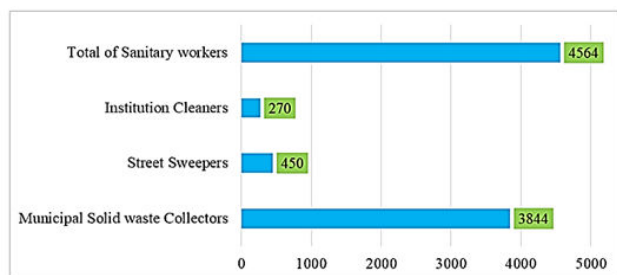


Figure 2: The graph of number of workers.

### Techniques of Statistical

More than half percent of the authors used logistic regression to regret associated factors with occupational related injuries and musculoskeletal disorders (Figure 3).

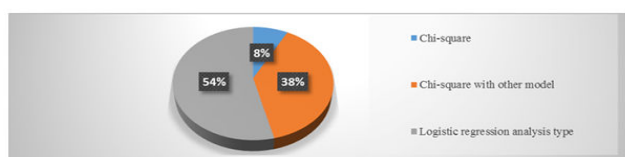


Figure 3: The pie graph of logistic regression analysis type.

Table 1: Studies on associated factors of occupational related injuries/ORI among sanitary workers.

Associated factors of ORI			Confidence interval (CI=95%)		
Authors	Socio-demographic	OR	Lower Limit	Upper Limit	P-value
Rachiotis, et al.	Age years >42* vs. <42 years	22.57	7.29	69.88	P<0.001
Rachiotis, et al.	Age years >42* vs. <42 years	5.22	1.35	20.1	p<0.001
Bogale, et al.	Experience <1* vs. 1 year	1.73	1.06	2.84	p<0.001
Rachiotis, et al.	Educated vs. illiterate*	2.19	1.01	4.78	p<0.05
Eskezia, et al.	Educated vs. illiterate*	2.22	1.22	4	p<0.05
Melaku, et al.	Experience <5 years* vs. >5 year	1.86	1.01	2.18	p<0.05
Eskezia, et al.	Experience <3 years* vs. >5 year	1.92	1.11	3.31	p<0.05
Melaku, et al.	Family size >4* vs. <4 families	1.76	1.15	2.71	p<0.05
Bogale, et al.	Family size >5* vs. <5 families	0.21	0.1	0.44	p<0.05
Bogale, et al.	Family >4 size* vs. <2-4 families	0.52	0.3	0.93	p<0.05
Bogale, et al.	Married families* vs. Single	1.89	1.09	3.28	p<0.05

### Behavioral variables

### Associated Factors of Occupational Injuries

Age (OR: 22.57; CI 95%: 7.29-69.88; p 0.001), education (OR: 2.22; CI 95%: 1.22-4.00; p 0.05), and work experience (OR: 1.92; CI 95%: 1.11-3.31; p 0.05) were the significant predictors for the occurrence of occupational injuries. Cigarette smoking (OR: 2.6; CI 95%: 1.55-4.34; p 0.05); sleeping disruption (OR: 2.57; CI 95%: 1.48-4.47; p0.05); eating/smoking/drinking at work (OR: 3.85; CI 95%: 1.34-11.06; p 0.001). Personal protective equipment (OR: 2.62; 1.48-4.63; p 0.05) is one of the safety variables (Table 1).

Bogale, et al.	Drinkers* vs. Non drinkers	1.85	1.14	3	p<0.01
Mamuya, et al.	Smoker* vs. non-smoker	2.6	1.55	4.34	p<0.05
Eskezia, et al.	Had job stress* vs. hadn't	1.94	1.11	3.4	p<0.05
Eskezia, et al.	Sleeping disturbance* vs. hadn't	2.57	1.48	4.47	p<0.05
Bogale, et al.	Sleeping disturbance* vs. hadn't	1.64	0.77	3.46	p<0.01
Rachiotis, et al.	Eating/smoking/drinking* vs. hadn't	3.85	1.34	11.06	p <0.001

#### Occupational safety variables

Melaku, et al.	Transport and collection* vs. sweeping	8.5	0.34	48.81	p <0.05
Bogale, et al.	Lack of PPE* vs. fully suited ad	2.62	1.48	4.63	p <0.05
Melaku, et al.	More than 8 hours* vs. <8 hours	1.76	1.22	2.68	p <0.05
Melaku, et al.	Only use mask* vs. fully suits PPE	2.31	1.32	4.04	p <0.05
Ephraim, et al.	lack of PPE* vs. fully suited	2.24	1.21	4.17	p <0.001

**Note:** Asterisk (\*) Shows that those were more likely had occupational related injured.

### Associated Factors of Musculoskeletal Disorders

From a total of eligible studies (13), six (6) studies were selected for musculoskeletal disorders among sanitary workers. For development of musculoskeletal disorders from sociodemographic factors; education (OR: 6.73; CI 95%: 1.92-23.51; p=0.006); age (OR: 7.56; CI 95%: 2.18-26.18; p=0.006); work experience (OR: 10.79; CI 95% 3.49-33.38; p=0.010). From behavioral factors; cigarette smoking Cigarette (OR: 0.14; CI 95%: 0.03-0.64; p=0.04); job satisfaction (OR:

11.43; CI 95%: 2.04-64.08; p=0.010). From Occupational safety variables; time pressure (OR: 3.25; CI95%: 1.08-9.77; p=0.035); working more than 8 hours (OR: 3.5; CI 95%: 1.543-8.204; p=0.003). Body position; working >2 hours (OR: 8; CI 95%: 2.25; 28.85; p=0.001) and awkward posture (OR: 15.7; CI 95%: 6.47-38.18; p<0.001) (**Table 2**).

**Table 2:** Associated factors of musculoskeletal disorders among sanitary workers.

Authors	Associated factors	Odd ratio	Lower limit	Upper limit	P-value
Reddy, et al.		<b>Socio-demographic</b>			
Reddy, et al.	Primary/secondary	6.73	1.92	23.51	p=0.006
Reddy, et al.	Age (<45* vs. >45 years)	7.56	2.18	26.18	p=0.006
Salve, et al.	Age (>35* vs. <35 years vs.) with high	3.04	1.28	7.23	p<0.001

Salve, et al.	Experience >10* vs. 10 years	5.78	1.57	21.3	p<0.001
Melese, et al.	Experience (>6* vs. <60 months)	2.5	1.127	5.522	p=0.024
Salve, et al.	Experience (>10* vs. <10) on Elbow	10.79	3.49	33.38	p=0.010
Pintakham, et al.	Experience (<13* vs. >13 years)	1.12	1.1	12.4	p=0.024
Singh, et al.	Work experience (>10 vs. <10 years)	2.15	1.12	4.14	p=0.010
Pintakham, et al.	Age (>40* vs. <40 years)	1.11	1.03	1.19	p=0.006
<b>Behavioral factors</b>					
Pintakham, et al.	Cigarette smokers* vs. non-smokers	0.14	0.03	0.64	p=0.04
Pintakham, et al.	Alcohol drinker* vs. non-drinkers	0.18	0.04	0.83	p=0.028
Salve, et al.	Job dissatisfaction* vs. satisfaction	11.43	2.04	64.08	p=0.010
Salve, et al.	Substance use (>2* vs. <2)	3.07	1.17	8.02	P<0.05
Salve, et al.	Mental health* vs. good status	6.35	1.63	24.68	p<0.001
Melese, et al.	Feeling exhausted* vs. not feeling	2.7	1.161	6.203	p=0.021
Melese, et al.	Occupational safety variables				
Melese, et al.	Existence of time pressure* vs. not	3.25	1.084	9.777	p=0.035
Melese, et al.	Working hours/day* vs. Not	3.5	1.543	8.204	p=0.003
Melese, et al.	Working (vs >2 hours)* vs. not	8	2.25	28.85	p=0.001
<b>Posture, BMI and others</b>					
Melese, et al.	Awkward posture* vs. hadn't	15.7	6.47	38.18	p<0.001
Pintakham, et al.	BMI (<23 vs. >23*)	1.18	1.03	1.35	p=0.013
Pintakham, et al.	Distance (km/day) (<2 vs. 2<*)	25.91	2.87	23.36	p=0.004
Pintakham, et al.	Weight of the broom (g) (<800 vs. 800<*)	4.64	1.02	21.08	p=0.047
Pintakham, et al.	Length of the broom (cm) (<160 vs. 160<*)	10.01	1.72	58.37	p=0.010

Pintakham, et al.	Weight of dustpan (g) (<1700 vs. 1700<*)	2.64	1.073	6.48	p=0.035
Singh, et al.	Waste pickers* vs. gardens	3.52	1.69	7.36	p=0.047
Salve, et al.	Location of work: Slum* vs. not	10.64	3.48	32.5	p=0.010

## DISCUSSION

### Reviewed Data

From the databases and other recovered data and publications, a total of 78 studies were discovered. From databases and titles, around 59 studies were identified. From these seventeen studies, seventeen were removed due to duplicates before screening, sixteen were marked as ineligible by automation tools, and six studies were removed for other reasons. After the abstracts of the remaining twenty studies were screened, ten were excluded then eleven studies were sought for retrieval, and only eight were included. Furthermore, fifteen new research and reports were located through websites, organization, and searching citation, with only one new study included. In addition, four studies from the previous version review were included. Identified a large number of studies that met the review's inclusion criteria, representing a potentially large body of evidence. Regarding inclusion, the review restricted some studies to be inclusive due to unmatched design, outdated, mixed with other occupations out and unfit output; with unknown population, unclear methods and output. As the result, thirteen (13) studies were included for associated factors of occupational related injuries and musculoskeletal disorders. As studied population, all sanitary workers; namely street sweepers, waste water treatment workers, health facility/hospital cleaners, general sanitary workers, waste collectors and sewage workers. Of these, majority of them were solid waste collectors and followed by street sweepers.

The majority (more than three-quarters) of the research in the current evaluation utilized cross sectional studies with an observational checklist; a few used cross sectionals with a control group; and a few used cross sectionals with a focus group discussion. In terms of statistical models, the majority of them used logistic regression, binary and multiple regression analysis, as well as bivariate and multivariate regression analysis. *Chi-square* is followed by additional models such as *Chi-square* with Fisher's exact test, logistic regression, multiple comparisons, and binary logistic regression.

### Factors for Occupational Related Injuries

The variables are classified into three categories: sociodemographic characteristics variables/factors, occupational safety variables, and behavioral variables, all of which have been identified as risk factors for the

occurrence of occupational related accidents. All of the factor categories are addressed in detail below.

**Sociodemographic factors:** One of the risk factors for occupational injuries was the age of the sanitary personnel. Rachiotis et al., discovered that people over the age of 42 were 22.57 times more likely (OR=22.57; 95% CI=7.29-69.88) to be exposed to the hepatitis A virus than those under the age of 42. Rachiotis et al., with other study also indicated that waste collectors being greater than 42 years old 5.22 time more like (OR: 5.22; 95% CI, 1.35-20.1) were independently associated with the anti-hepatitis B virus infection positivity exposed to waste (OR: 4.05; 95% CI, 1.23-13.33) as compared to less than 42 years. The other one is gender, the report obtained from Bogale, et al., indicated that male workers reported more injuries than female, male workers were 2.2 times more likely to be injured than female workers (OR=2.2, 95% C.I=1.39-3.56). This can be explained by the fact that the majority of males conduct heavy work such as hauling, lifting, and loading vehicles, whilst the majority of females perform jobs such as rubbish transfer from the roadside to a local transfer station. The third factor is the marital status of the sanitation workers. According to the findings of this study, married solid trash collectors were 1.89 times more likely to be injured than single solid waste collectors (OR=1.89, 95% CI=1.09-3.28). Furthermore, this study found that those with two or fewer children had a 79% lower risk of occupational injury than those with five or more children (AOR=0.21, 95% CI: 0.10-0.44). Similarly, the odds of injury were cut in half for individuals with 3-4 children (AOR=0.52, 95% CI: 0.30-0.93). According to the other study, solid waste collectors/MSW with a family size of more than four were 1.76 times more likely to experience occupational health symptoms than those with a family size of four or less (AOR=1.76, 95% CI=1.15-2.71). The fourth factor is sanitary employees' work experience. Working experience was found to have a significant relationship with the occurrence of occupational injury in the study. Solid waste collectors with more than one year of experience were more likely than their counterparts to report occupational injury (OR=1.73, 95% C.I=1.06-2.84). As Rachiotis, et al., reported duration of employment (3.57; 95% CI=1.15-11.08) was independently associated with the risk of HAV infection. The other study also confirmed that the likelihood of occupational injury was found to be significantly higher (OR = 1.92 95 % CI: 1.11, 3.31) among respondents with three or less service years. In contrast, MSWs with more than 5 years of experience were 1.86 times more likely to suffer occupational health complaints than those with less than 5 years of experience (AOR=1.86, 95% CI=1.01-2.18). The fourth one is a

monthly salary. According to one study, having less than 600 monthly pay Eth Birr was 4.09 times more likely to get harmed (AOR=4.09 95% CI: 2.15, 7.76) than having more than 600 monthly salary. Furthermore, illiteracy was 2.22 times (AOR=2.22 95% CI: 1.22, 4.04) more common among wounded waste collectors than among literate waste collectors. The sixth factor is education, which was independently related with the incidence of HAV infection (OR=2.19; 95% CI=1.01-4.78).

**Occupational safety variables:** According to certain research, a lack of PPE was strongly connected with occupational injury among solid waste collectors. Ephraim et al., confirmed that those involved in collecting and transportation were 8.5 times more likely than those involved in other work activities to incur an occupational injury (AOR=8.5; 95% CI: 0.34, 48.81). (Collection and transportation). Respondents who reported a lack of PPE were found to be 2.24 more likely to have an occupational injury (AOR=2.24; 95% CI: 1.21, 4.17). Moreover, another study found that solid waste collectors who just wore a mask were 2.31 times more likely to experience occupational health problems than those who wore a full body suit (AOR=2.31, 95% CI=1.32-4.04). Municipal solid trash collectors who worked more than 8 hours per day were 1.76 times more likely to develop occupational health symptoms than those who worked 8 or less hours per day (AOR=1.76, 95% CI=1.22-2.68). According to Bogale, et al., garbage collectors who did not use PPE at all times while on duty had 2.62 times more occupational injury (AOR=2.62, 95% CI: 1.48-4.63) than those who did use PPE at all times while on duty.

**Behavioral variables:** The study's findings demonstrated that alcohol use was statistically connected with the occurrence of occupational injury. Rubbish collectors who ate/smoked/drank during rubbish collection were 3.85 times more likely to be anti-HAV positive (OR=3.85; 95% CI=1.34-11.06) than those who did not. Alcohol use and cigarette smoking were found to be statistically linked with occupational injury in this study. Alcohol users were 1.85 times more likely to be injured than nonusers (OR=1.85, 95% CI=1.14-3.00). A similar study discovered that cigarette smoking had a substantial relationship with the prevalence of occupational injury. Cigarette smokers were 2.60 times more likely than nonsmokers to be injured (OR=2.60, 95% CI=1.55-4.34). Cigarette smoking was linked to an increased risk of occupational harm. Furthermore, those who reported job-related sleeping disturbance had 2.57 times (OR: 2.57; 95% CI: 1.48, 4.47) higher risk of occupational injury than their counterparts. The final is Job related stress. Job related stress (AOR=1.94 95% CI: 1.11, 3.40) was also significantly and positively associated with occupational injury.

### Associated Factors of MSDs

The main factors identified as associated factors for the development of MSDs among sanitary workers are sociodemographic characteristics variables, occupational safety variables, and behavioral variables, work design and

pattern, material used, work location, distance traveled by sanitary workers, and body mass index.

**Sociodemographic variables:** As study indicated sanitary workers working for 10 or more years were significantly more likely to suffer from MSDs in the elbows (OR=10.79;  $p<0.01$ ) as compared to street sweepers working less than 10 years. Moreover, sanitary workers like cleaners who had more than or equal to 6 months of work experience were 3 times more likely to develop MSDs compared to those who had less than 6 months (AOR=2.5, 95% CI=1.12–5.52). MSDs are the cumulative effect of repetitive physical load and work experience was found to be positively associated with MSDs among cleaners. Similarly, an increase in work duration was correlated with an increase in complaints of MSDs in different parts of the body. For instance, respondents working for more than 10 years were more likely to report MSDs of the shoulder (OR 2.01;  $p<0.1$ ) and lower back (OR 2.15;  $p<0.05$ ) compared to those who had been working for 4 years. Moreover, the respondents over the age of 40 were 5.41 more likely to experience MSDs of the knee (OR 5.41;  $p<0.01$ ) compared to those in the 18-30 years old age group.

**Behavioral variables:** The study indicate that job satisfaction and MSDs were also found to be significantly correlated as the sweepers who were not satisfied with their job were more likely to have suffered from the MSDs in the wrists/hands (OR=11.43;  $p<0.01$ ). As Melese, et al. found, self-reported MSDs of cleaner was significantly associated with time pressure (AOR=3.25, 95% CI=1.08–9.77). That means cleaners who had time pressure while performing their tasks were 3.2 times more likely to develop MSDs compared to those who had no time pressure. Moreover, this study also revealed that feeling exhausted became statistically significant with adjusted odds (AOR=2.7, 95% CI=1.16–6.20;  $p=0.02$ ). This indicates that those who felt exhausted after their work were 2.7 times more likely to develop MSDs than those who had not felt exhausted. As Pinkham and Siriwong, reported age and BMI of were street sweeping were negative association with cigarette smoking, alcohol drinking ( $p<0.05$ ) for MSDs development. While, distance and length of the broom, there was a positive association with working experience, weight of broom, and total weight of broom and dustpan ( $p<0.05$ ).

Moreover, Salve et al., highlighted that the complaints of MSDs were significantly higher among the waste loader aged 35 years old and above, particularly for hips/thighs (Odds Ratio (OR)=3.04,  $p<0.01$  and upper back (OR=2.26,  $p<0.05$ ) as compared to 19-34 years old. This study also stated that waste loader those who were working for 10 or more years were more likely to suffer from MSDs for shoulders (OR=4.57,  $p<0.01$ ), upper back (OR=2.94,  $p<0.05$ ) and low back (OR=3.14,  $p<0.05$ ) compared to those working for less than 10 years. The analysis of the effect of mental health on MSDs revealed that workers with poor mental health status were significantly more likely to report MSDs for upper back (OR=2.95,  $p<0.05$ ) and shoulders (OR=3.26,  $p<0.05$ ) as compared to workers having good mental health status. As expected, those having 10 or more years of engagement in waste loading were significantly more likely to report



disabilities for wrists/hands (OR=5.78,  $p<0.01$ ), shoulders (OR=4.81,  $p<0.01$ ), hips/thighs (OR=3.96,  $p<0.01$ ), upper back (OR=3.94,  $p<0.01$ ) and low back (OR=3.59,  $p<0.01$ ) as compared to those working for less than 10 years. This study also revealed that sanitary workers (waste loaders) those having 2 or more types of addiction, particularly for shoulders (OR=3.03,  $p<0.05$ ), hips/thighs (OR=3.07,  $p<0.05$ ) and low back (OR=2.92,  $p<0.05$ ) as compared to those who were not consuming any substances.

**Posture and work design and pattern:** As study found cleaners working in an awkward position were 15 times more likely to develop MSDs and were strongly associated with MSDs (AOR=15.7, 95% CI=6.47-38.17,  $p<0.001$ ) as compared to the counterpart. The location of work too was found to be a significant predictor of developing MSDs. Sweepers working in high slum concentration areas were more likely to get MSDs in the hips/thighs (OR=10.64;  $p<0.01$ ). The other study indicated that those working hours greater than or equal to 8 hours per day 3.55 times more likely to develop MSDs (AOR=3.55, 95% CI=1.54–8.20,  $p=0.003$ ) than those working hours less than 8 hours per day [24]. Moreover, cleaners those who work more than two hours in a sustaining position were 8.05 times (AOR=8.055, 95% CI=2.25-28.85) as compared to less than two hours in a sustaining position.

## CONCLUSION

The evidence obtained suggests that sanitation employees are at an elevated risk of occupational related risks such as occupational related injuries and musculoskeletal disorders because of socio demographic variables, occupational safety with work pattern characteristics, and behavioral factors. Therefore, the evidence stated these occupational health and safety outcomes are linked mentioned associated factors that require governmental institutional guidelines, regulations, and other efforts to reduce among sanitary workers.

## LIMITATIONS

Almost all of the included studies in this systematic review used a cross-sectional study design, which may result in selection bias and information bias at the sampling stage, and confounders may be one of the weak points of this design that leads to erroneous interpretation. It used a thorough search technique, however phrases used to describe sanitation employees may differ among geographical regions, countries, languages, and cultures, and some research may have gone unnoticed.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

## CONSENT FOR PUBLICATION

The current publication is not published yet.

## AVAILABILITY OF DATA AND MATERIAL

We consent the data deposit in a public repository that meets appropriate standards of archiving, citation, and supplement information files under alongside of our manuscript; we can provide an explanation and details of any restrictions on access if data are not freely available, and acceptable justifications for restricting access may include legal and ethical concerns.

## COMPETING INTERESTS

Not applicable.

## FUNDING

Not applicable.

## AUTHORS' CONTRIBUTIONS

ST\* and GK developed systematic review extracted data from engines. WD and GD systematized data and assessed quality of the paper. ST\* and GGD compiled data and framed all components. All authors equally contributed for the manuscript.

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## REFERENCES

1. Arruda E (2010) Identification of institutional risks in nursing professionals. *J Acad Nutr Diet.* 1(1):01-16.
2. Souza R (2016) Occupational diseases of workers cleaning service in hospital environment. *Enfermia Global.* 15(2):552-564.
3. Gomathi P, Kamala K (2020) Threatening health impacts and challenging life of sanitary workers. *J Evolution Med Dent Sci.* 9(41):3061.
4. Oza H (2022) Occupational health outcomes among sanitation workers; A systematic review. *Int J Hyg Environ Health.* 240(113907):01-11.
5. Comaru FEW (2013) The health of workers in selected sectors of the urban economy: Challenges and perspectives. 7(3):145-167.
6. Woods V, Buckle P (2006) Musculoskeletal ill health amongst cleaners and recommendations for work organisational change. *Int J Ind Ergon.* 36(1):61-72.
7. Alamgir H, Shicheng Y (2008) Epidemiology of occupational injury among cleaners in the healthcare sector. *Occup Med (Lond).* 58(6):393-399.

8. Bogale D (2014) Assessment of occupational injuries among Addis Ababa city MSW collectors. *BMC Public Health*. 14:150-169.
9. Melaku T, Tiruneh M (2020) Occupational health conditions among MSW Collectors in Addis Ababa, Ethiopia. *Risk Manag Healthc Policy*. 13:2415–2423.
10. Eskezia D (2016) Prevalence and associated factors of occupational injuries among MSW collectors, Amhara, Ethiopia. *BMC Public Health*. 16(1):862.
11. Gebreeyessus GD (2022) Knowledge, attitude, and practices on occupational health and safety principles among cleaners: The case of Tikur Anbassa specialized referral hospital, Addis Ababa, Ethiopia. *Open Health*. 3:22-33.
12. Haagsma J (2016) The global burden of injury: Incidence, mortality, disability adjusted life years and time trends. *Online Inj Pre*. 22:03-18.
13. Leitao I (2008) Occupational health: Analyzing the risks related to the nursing team in an intensive care unit. *Cienc Care Health*. 7(4):476-484.
14. Wahab B, Ogunlola B (2014) The Nature and challenges of street sweeping in Ado-Ekiti. *Afr J Psychol Study Soc*. 7(3):145-167.
15. Shi Y (2020) Prevalence of occupational exposure and its influence on job satisfaction among Chinese healthcare workers. *BMJ Open*. 10(4):e031953.
16. Mamuya S, Badi S (2019) Factors contributing to occupational injuries among solid waste collectors in a municipal in Tanzania. *MOJ Public Health*. 8(6):237-241.
17. Amisshah J (2019) The cost of managing occupational injuries among frontline construction workers in Ghana. *Value Heal Reg Issues*. 19:104-111.
18. Salve P, Chokhandre P (2016) Assessing the exposure of street sweeping for developing musculoskeletal disorders and related disabilities. *BMJ Open*. 6(12):e012354.
19. Salve P (2017) Assessing musculoskeletal disorders among municipal waste loaders of Mumbai India. *Int J Occup Med Environ Health*. 30(6):875-886.
20. Singh S, Chokhandre P (2015) Assessing the impact of waste picking on musculoskeletal disorders among waste pickers in Mumbai, India: A cross-sectional study. *BMJ Open*. 5(9):e008474.