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Occupational Hazards, Safety Practices, and Serological Findings among Mortuary Workers in Uttar Pradesh: A Cross-Sectional Study

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ABSTRACT:

Background: Mortuary workers are an understudied occupational group with potential exposure to biological, chemical, mechanical and physical hazards. There is a paucity of evidence regarding occupational exposures, safety practices and selected serological markers among morgue workers in India especially in Uttar Pradesh. The present study assessed reported occupational exposures, workplace safety practices, infectious-disease awareness, use of personal protective equipment (PPE), workplace injuries, and select serological findings among workers employed in selected government morgues in Uttar Pradesh.

Methods: The present study is a cross-sectional descriptive study carried out amongst 107 selected and willing mortuary workers who were randomly selected from selected government district mortuaries in different administrative zones of Uttar Pradesh. Purposive sampling was used in the selection of facilities and the willing subjects in the selected facilities during data collection time. Data were collected using a pre-tested, structured, interview administered questionnaire, which included sociodemographic information, occupational details, knowledge of selected infectious diseases, occupational exposures, workplace injuries, personal protective equipment use, immunization status and chemical exposure. Serological testing for HIV, HBsAg, and anti-HCV was done using commercial enzyme linked immunosorbent assay kits from venous blood samples.

Results: There were more males (106 (99.1%)) in the workforce, while 81 (75.7%) respondents had over five years of work experience. The number of people who

underwent occupational health training was 16 (15.0%). While there were 68 (63.6%) respondents who were aware of hepatitis, there were 30 (28.0%) who thought that their job could expose them to hepatitis B. There were 64 (59.8%) respondents who reported having received immunization against hepatitis B. This information was self-reported and was not verified against vaccination records. Awareness of tetanus and tuberculosis was very high (106 (99.1%) each). Personal protective equipment was not always used, while gloves [68 (63.6%)] and face masks (67 (62.6%)) were the common equipment used. Less common equipment included gowns (21, or 19.6%) and eye goggles (6, or 5.6%). Thirty-nine (36.4%) of the respondents reported work-related injuries, which included 37 (34.6%) sharp injuries, one (0.9%) splash injury, and one (0.9%) slip/trip/fall injury. The number of respondents reporting work-related injuries immediately was 16 (15.0%). The serological screening detected one (0.9%) HIV-reactive result, two (1.9%) HBsAg-reactive results, and one (0.9%) anti-HCV-reactive result.

Conclusion: The survey found deficiencies in terms of occupational health training, personal protective equipment uses, risk perception regarding infectious diseases, injury reporting, and workplace safety practices of the staff in selected government mortuaries. Serology results indicate screening reactivity and do not imply occupational exposure or acquisition of infection. Improved occupational health training, proper use of PPE, injury and post-exposure reporting, vaccination and occupational health surveillance could enhance workplace safety.

INTRODUCTION

The health and safety of workers are fundamental rights that underpin both individual well-being and national productivity. Yet, in many developing countries, these rights are frequently compromised. A complex web of systemic neglect, resource constraints, and inadequate policy implementation often results in the marginalization of occupational health, particularly for vulnerable worker populations [1, 2]. Among these, mortuary workers represent a highly exposed yet grossly understudied group whose occupational realities remain largely invisible in public health discourse [3].

Globally, the International Labour Organization (ILO) estimates that approximately 2.78 million workers die annually from work-related injuries and diseases, of which 2.4 million deaths are attributed specifically to occupational illnesses [4,5]. Low- and middle-income countries carry a disproportionately high share of this global burden [6] and the resulting losses extend beyond individual suffering to create significant socioeconomic consequences for families, healthcare systems, and the broader community [7].

Within the healthcare sector, exposure to hazards is not uncommon; however, some work environments, such as mortuary departments, present substantially higher risks. Mortuary workers are routinely exposed to a spectrum of occupational threats including biological agents (viruses, bacteria, fungi), chemical hazards (formalin, solvents), physical risks (electrical shocks, poor lighting), mechanical dangers (sharps injuries, slips, falls), and significant psychosocial stressors such as stigma, anxiety, and work-induced depression [8,9]. Their daily duties-transporting cadavers, assisting with autopsies, preparing bodies, handling tissue specimens, and maintaining sanitation-further increase their vulnerability to infectious disease and workplace trauma [10].

Studies have consistently shown that knowledge of workplace hazards and adoption of preventive safety measures among mortuary workers remain suboptimal [9]. Poor occupational health and safety (OHS) knowledge, combined with inadequate PPE use and weak reporting mechanisms, have been associated with rising incidences of work-related illnesses and injuries such as viral hemorrhagic fevers, allergic dermatitis, eye and airway irritation, and even COVID-19 [11,12]. Furthermore, many cases go unreported or are inaccurately documented, leaving the true burden of occupational disease grossly underestimated [4].

Mortuary departments in public healthcare facilities often operate with limited budgets, scarce supplies, and minimal managerial oversight. These constraints frequently lead to inconsistent or absent implementation of safety protocols such as hand hygiene, regular PPE provision, and routine training [13]. Most available research has focused on individual occupational hazards or safety practices, while comparatively less attention has been given to the combined assessment of biological, chemical, mechanical, and other occupational exposures among mortuary workers [14]. Consequently, under-reporting and under-recognition of these hazards persist, further exacerbating the risk of long-term occupational harm [4].

In the case of India, literature that deals specifically with issues related to occupational health and safety of mortuary workers is very rare, and especially rare in the state of Uttar Pradesh. While some literature does exist on occupational health and safety issues, they have mostly focused either on occupational hazards, knowledge, safety practices, or perception of infection. However, there are few details about the correlation between occupational exposure factors and selected serological outcomes among mortuary workers.

In view of the foregoing deficiencies, the current study sought to evaluate the occupational exposures, safety behaviors, disease knowledge, PPE usage, work-related injuries, chemical exposure and certain serological results including HIV, hepatitis B surface antigen (HBsAg) and HCV infection amongst mortuary workers from selected district mortuaries in Uttar Pradesh, India. Specifically, the study intended to determine the described occupational health and safety status of these workers and the prevalence of certain serological markers. Given that the study employed a cross-sectional design, no causality could be established or any of the serological finding linked to occupational exposure.

With this understanding of some of the problems, it is against this backdrop that the current study attempted to characterize occupational exposures, safety practices, disease awareness, use of personal protective equipment (PPE), work-related injuries, exposure to chemicals, and selected serologic markers among the mortuary workers working in selected district mortuaries in Uttar Pradesh, India. In particular, this study was designed to characterize the occupational exposures and safety practices, knowledge and awareness and perception of occupational risk of selected infections, workplace injuries and PPE use, and the prevalence of selected serologic markers, such as HIV, hepatitis B surface antigen (HBsAg), and hepatitis C virus (HCV). The study was descriptive in nature.

MATERIALS & METHODS

Study Design and Setting

A cross-sectional descriptive study was done on workers working in selected government district mortuaries in various administrative regions of Uttar Pradesh, India. The facilities were purposefully selected for this study to bring about variations in work load, infrastructural conditions, and the occupational environment. They are involved in the conduct of medicolegal autopsies, storage of corpses, body handling, and other related mortuary activities.

Sampling and Sample Size

In total, 107 eligible and consenting workers were enrolled. Participating mortuaries were purposely selected, which means that the recruitment process was not a census of all mortuary workers in Uttar Pradesh. Rather, eligible and consenting workers available in the participating facilities during the study period were recruited. There was no sample size calculation conducted for the study, as it was meant to be a descriptive study of the available pool of workers in the participating facilities. The current manuscript is missing details about the sampling frame to conduct the facility-level participation rate. The final draft should include information about the total number of eligible government district mortuaries in the sampling frame, number of facilities approached, number of facilities participating, number of eligible workers in each facility, number of recruited workers, number of unavailable or unwilling to participate, and participation rate.

Operational Definition and Study Population

For the purpose of this study, a mortuary worker was defined as an adult worker employed within a participating mortuary and engaged in duties directly or indirectly related to mortuary operations, including cadaver handling, autopsy assistance, sanitation, specimen or material handling, transport, documentation, security, or other facility-support activities. Participants were eligible if they were aged 18 years or older, had been employed in mortuary-related work for at least one month, and provided informed consent. Individuals who were absent during the data-collection period or declined participation were

excluded. Because occupational exposure varies according to job role, participants were not assumed to have equivalent exposure intensity. Autopsy personnel, sanitation workers, and other workers with direct cadaver/body-fluid exposure should therefore be distinguished from predominantly administrative, security, transport, or other indirect-exposure personnel where the original dataset permits.

Data Collection

Data collection was carried out through a structured and pre-tested interview administered by an interviewer. Interviews were done through face-to-face interviews in a private environment. The interview contained six sections, which included (i) socio-demographic characteristics; (ii) occupational history and profile; (iii) awareness of specific infectious diseases and modes of their transmission; (iv) occupational exposures and injuries at the workplace; (v) PPE usage and occupational health practices; and (vi) vaccination history and chemical exposures. The interview schedule was developed after reviewing the literature and consulting the experts in forensic medicine and occupational health. The pre-testing of the interview schedule was done prior to the actual data collection process to determine its clarity, relevancy, and understandability. This manuscript does not contain a valid knowledge test or scoring system. Individual answers related to disease transmission routes will be reported as the participant's perceptions and not as "right" or "wrong" unless the exact answer key is available in the primary study records.

Ethical Considerations

This research was granted approval by the Institutional Ethics Committee of King George's Medical University, Lucknow, India, through the grant number 77/Ethics/2024. The date of granting the approval should be mentioned in the paper precisely as 03/04/2024. All workers involved in the study have provided informed consent. Since the research entailed venous blood sampling and determination of HIV, HBsAg, and anti-HCV infections, the manuscript needs to indicate whether informed consent included separate written consent for blood sampling and determination of infection status. It should be described how confidentiality has been ensured and how the identification of participants, notification of reactive results, and referral were arranged. No personal identifying information has been used in the manuscript.

Sample Collection and Handling

For blood testing, venous blood samples of about 3-5 ml have been taken from the blood of willing participants by applying sterile vacutainer systems. The collected samples were marked with names according to the study and were sent to the laboratory while maintaining a cold chain delivery. The blood serum was separated two hours after collection and kept in a temperature range of 2-8 degrees Celsius before analysis. Proper biosafety measures were followed for the sample collection and testing.

Serological Testing

Serological screening for HIV, HBsAg, and HCV antibodies was done using commercially available enzyme-linked immunosorbent assay (ELISA) kits made by J. Mitra & Co. Pvt. Ltd., New Delhi, India.

HIV screening was performed using the Microlisa HIV Ag & Ab Fourth Generation ELISA (J. Mitra & Co. Pvt. Ltd., New Delhi, India), which detects HIV-1 p24 antigen and antibodies against HIV-1 and HIV-2. Hepatitis B surface antigen (HBsAg) was detected using HEPALISA ELISA (J. Mitra & Co. Pvt. Ltd., New Delhi, India), while anti-hepatitis C virus (HCV) antibodies were detected using HCV Microlisa Third Generation ELISA (J. Mitra & Co. Pvt. Ltd., New Delhi, India). Serum samples were processed according to the manufacturers' instructions, with appropriate positive and negative controls included in each assay. Optical density was measured at 450 nm, and results were interpreted according to the cut-off values specified by the respective manufacturers.

The specific details about coating, conjugate reactions, tetramethylbenzidine (TMB) development and other parts of the test process have not been included because they do not really help with making the test again beyond knowing the test the manufacturer, the type of sample and how to read the results.

Results that come back as positive should be reported based on the confirmatory process used in the study. The current paper does not fully explain the confirmatory steps for HIV, HBsAg, or anti-HCV. So until the original lab records are checked, the results are called "reactive" or "serological reactivity" and are not called confirmed infections.

The exact HIV confirmatory process, the lab that did the testing the way HBsAg was confirmed and the way HCV was confirmed should be added from the lab records before the final version is sent.

HIV testing (Microlisa HIV Ag & Ab, fourth generation)

HIV screening was performed using the Microlisa HIV Ag & Ab (Fourth Generation) ELISA (J. Mitra & Co. Pvt. Ltd., New Delhi, India), which detects both HIV-1 p24 antigen and antibodies against HIV-1 and HIV-2. The assay employs a sandwich ELISA format in which microwells coated with HIV-1 and HIV-2 recombinant antigens and HIV-1 p24 antigen capture the corresponding antibodies or antigen present in the specimen. Following washing, a horseradish peroxidase (HRPO)-labelled conjugate containing anti-HIV and anti-p24 antibodies binds to the immune complex. Colour development occurs following the addition of tetramethylbenzidine (TMB) substrate and is proportional to the amount of antigen or antibody present. Absorbance was measured at 450 nm, and samples exceeding the manufacturer's cut-off value were considered reactive and were retested for confirmation.

Immunization Status

Out of the 107 respondents, 64 of them (59.8%) said that they have been immunized for hepatitis B, whereas 43 (40.2%) respondents said that they have not been immunized. These figures are based on the responses provided by the respondents to the questionnaire. The medical records regarding their immunization were not available to determine what type of vaccine they took and how many shots they had taken in accordance with the vaccination schedule. Hence, the results should only be taken as self-reported immunization figures.

Quality Assurance

Laboratory equipment was calibrated before analysis, and all laboratory procedures were performed in accordance with the Organisation for Economic Co-operation and Development (OECD) Principles of Good Laboratory Practice (GLP) and Biosafety Level-2 (BSL-2) laboratory practices described in the World Health Organization (WHO) Laboratory Biosafety Manual to minimize contamination and ensure analytical reliability [15,16].

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics for Windows, Version 23.0 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized using frequencies and percentages. Continuous variables, where applicable, were summarized using appropriate measures of central tendency and dispersion.

The primary analysis was descriptive because the study was designed to characterize occupational exposures, safety practices, awareness, injuries, and selected serological findings. The original manuscript stated that chi-square or Fisher's exact tests were used for categorical associations; however, the submitted Results did not report corresponding test statistics, p-values, effect estimates, or confidence intervals. Therefore, no unsupported inferential claims have been retained in the revised manuscript.

If comparative analyses are undertaken using the original dataset, they should be prespecified, limited to clinically meaningful comparisons, account for potential clustering of participants within mortuaries where feasible, and report effect estimates with 95% confidence intervals. Missing responses should be reported using variable-specific denominators where applicable.

RESULTS

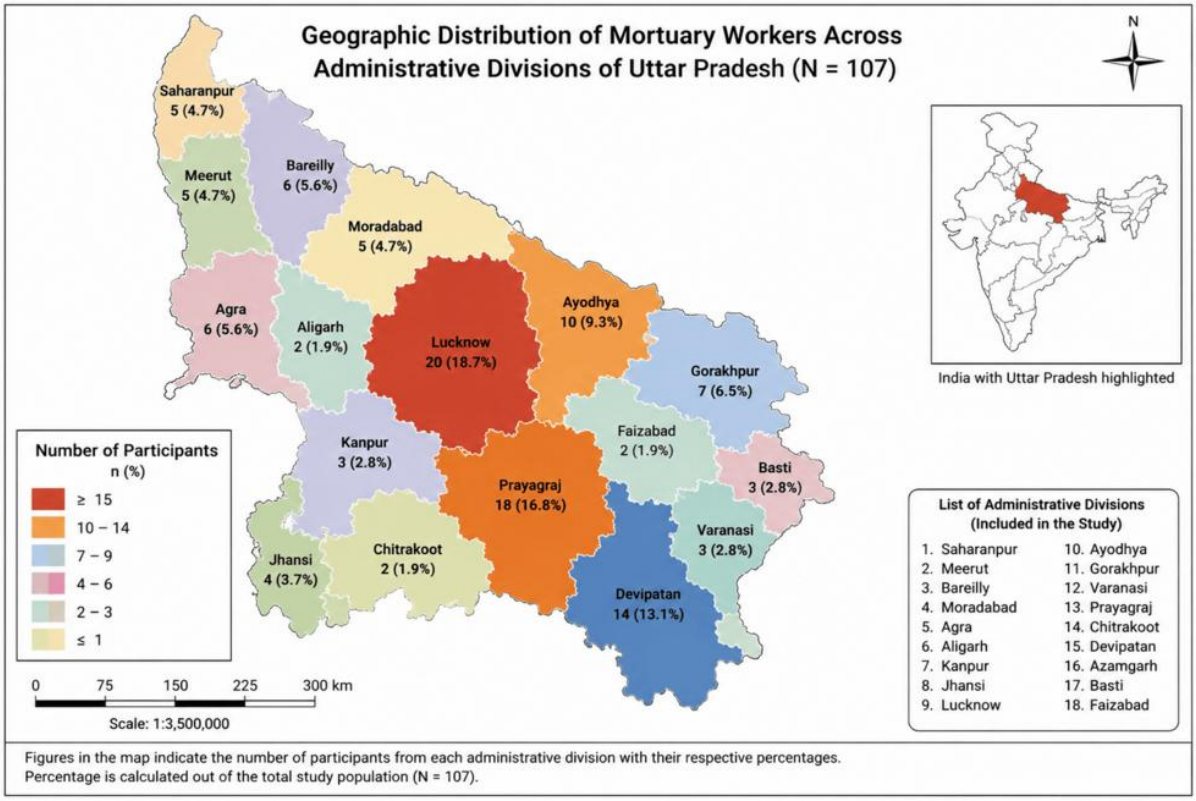

Figure 1: Geographic distribution of the study participants across the administrative divisions of Uttar Pradesh (N = 107)

Geographic distribution of the 107 mortuary workers recruited from the 18 administrative divisions of Uttar Pradesh. The highest number of participants was recruited from Lucknow 20 (18.7%), followed by Prayagraj 18 (16.8%), Devipatan 14 (13.1%), and Ayodhya 10 (9.3%). Participant distribution across the remaining divisions is presented in Figure *1*.

Figure *1* illustrates the geographic distribution of the study participants across the administrative divisions of Uttar Pradesh. The largest proportion of participants was recruited from Lucknow 20 (18.7%), followed by Prayagraj 18 (16.8%), Devipatan 14 (13.1%), and Ayodhya 10 (9.3%). Participants were recruited from all 18 administrative divisions, providing broad geographical representation of mortuary workers across the state.

Variable	Category	n (%)
Age (years)	**18–30**	**33 (30.8)**
	31–40	38 (35.5)
	41–50	26 (24.3)
	51–60	10 (9.3)
Sex	Female	1 (0.9)
	Male	106 (99.1)

Variable	Category	n (%)
Education	Illiterate	4 (3.7)
	Primary	10 (9.3)
	High school	24 (22.4)
	Intermediate	24 (22.4)
	Graduation	37 (34.6)
	Postgraduate	8 (7.5)
Religion	Hindu	92 (86.0)
	Muslim	15 (14.0)
Dietary history	Non-vegetarian	56 (52.3)
	Vegetarian	51 (47.7)
Occupational role	Autopsy	44 (41.1)
	Computer operator	6 (5.6)
	Discarded body worker	1 (0.9)
	Forensic doctor	1 (0.9)
	Guard	5 (4.7)
	In-charge	2 (1.9)
	Pharmacist	17 (15.9)
	Sweeper	8 (7.5)
	Transport	1 (0.9)
	Ward boy	21 (19.6)
	X-ray technician	1 (0.9)
Years of work	<1 year	6 (5.6)
	1–5 years	20 (18.7)

Variable	Category	n (%)
	>5 years	81 (75.7)
Marital status	Married	97 (90.7)
	Unmarried	9 (8.4)
	Widow	1 (0.9)
Family structure	Joint	92 (86.0)
	Nuclear	9 (8.4)
	Single	6 (5.6)
Working hours/day	<8 hours	22 (20.6)
	≥8 hours	85 (79.4)
Annual leave	0 leaves	69 (64.5)
	<12 leaves	34 (31.8)
	12–24 leaves	4 (3.7)
Formal occupational-health training	Yes	16 (15.0)
	No	91 (85.0)
Immunization reported	Yes	64 (59.8)
	No	43 (40.2)

Table 1: General and Sociodemographic Characteristics of Mortuary Workers (N = 107)

Values are presented as the number of participants [n (%)]. Percentages were calculated using the total study population (N = 107).

Table 1 summarizes the sociodemographic and occupational characteristics of the 107 participating mortuary workers. The participants were predominantly male [106 (99.1%)], with the largest proportion belonging to the 31-40-year age group [38 (35.5%)]. Most participants had completed graduation [37 (34.6%)], while 4 (3.7%) were illiterate. Autopsy personnel constituted the largest occupational group [44 (41.1%)], followed by ward boys [21 (19.6%)] and pharmacists [17 (15.9%)]. Most participants had more than five years of work experience [81 (75.7%)]. Despite this relatively long work experience, only 16 (15.0%) participants reported receiving formal occupational-health training. Regarding working conditions, 85 (79.4%) participants reported working for ≥8 hours per day, while 69 (64.5%) reported no annual leave. Overall, the table demonstrates a heterogeneous occupational workforce with substantial variation in job roles and work characteristics. The relatively low proportion reporting formal occupational-health training highlights an important area for occupational-safety improvement; however, the cross-sectional design does not establish a causal relationship between training and subsequent workplace practices.

Variable	Yes, n (%)
Heard of hepatitis viruses	**68 (63.6)**
Believed work could predispose to hepatitis B	30 (28.0)
Heard of tetanus	106 (99.1)
Believed work could predispose to tetanus	49 (45.8)
Heard of tuberculosis	106 (99.1)
Believed work could predispose to tuberculosis	19 (17.8)
Diagnosed with tuberculosis since starting this work	16 (15.0)
Believed work could predispose to HIV	35 (32.7)
Tested for HIV since starting this work	22 (20.6)

Table 2: Awareness of Infectious Diseases among Mortuary Workers (N = 107)

Values represent participants who responded "Yes" to each question and are presented as n (%), where percentages were calculated using the total study population (N = 107).

Table 2 describes awareness and perceived occupational risk regarding selected infectious diseases among the participating mortuary workers. Awareness of tetanus and tuberculosis was high, with 106 (99.1%) participants reporting awareness of each condition. Awareness of hepatitis viruses was comparatively lower [68 (63.6%)]. Despite high general awareness of some diseases, the proportion perceiving their occupation as a potential risk was considerably lower, particularly for hepatitis B [30 (28.0%)] and tuberculosis [19 (17.8%)]. Occupational risk was perceived by 49 (45.8%) participants for tetanus and 35 (32.7%) for HIV. Only 22 (20.6%) participants reported having undergone HIV testing after starting their occupation. These findings suggest a difference between general awareness of infectious diseases and recognition of their occupational relevance. However, because the study did not employ a validated knowledge scale and was cross-sectional, these findings should be interpreted as descriptive responses rather than evidence that limited awareness caused unsafe occupational practices.

Disease	Route	No, n (%)	Yes, n (%)
Hepatitis B	**Blood**	**65 (60.7)**	**42 (39.3)**
	Needlestick injury	22 (20.6)	85 (79.4)
	Fecal-oral	73 (68.2)	34 (31.8)
	Body fluid	94 (87.9)	13 (12.1)
Hepatitis C	Blood	51 (47.7)	56 (52.3)
	Needlestick injury	17 (15.9)	90 (84.1)
	Fecal-oral	79 (73.8)	28 (26.2)
	Body fluid	58 (54.2)	49 (45.8)
Tuberculosis	Blood	66 (61.7)	41 (38.3)
	Needlestick injury	39 (36.4)	68 (63.6)

Disease	Route	No, n (%)	Yes, n (%)
	Fecal-oral	38 (35.5)	69 (64.5)
	Body fluid	69 (64.5)	38 (35.5)
Tetanus	Blood	68 (59.8)	43 (40.2)
	Needlestick injury	31 (29.0)	76 (71.0)
	Fecal-oral	48 (44.9)	59 (55.1)
	Body fluid	69 (64.5)	38 (35.5)
HIV	Blood	45 (42.1)	62 (57.9)
	Needlestick injury	30 (28.0)	77 (72.0)
	Fecal-oral	57 (53.3)	50 (46.7)
	Body fluid	61 (57.0)	46 (43.0)

Table 3: Participants' Perceptions of Possible Transmission Routes for Selected Infectious Diseases (N = 107)

Values represent participants' reported perceptions. Responses are not classified as correct or incorrect because a validated answer key/scoring system was not documented in the manuscript.

Table 3 presents participants' reported perceptions regarding possible transmission routes for hepatitis B, hepatitis C, tuberculosis, tetanus, and HIV. For hepatitis B, 85 (79.4%) participants identified needlestick injury as a possible transmission route, while 42 (39.3%) identified blood exposure. For hepatitis C, 90 (84.1%) participants identified needlestick injury and 56 (52.3%) identified blood exposure. For HIV, 77 (72.0%) participants identified needlestick injury and 62 (57.9%) identified blood exposure. Responses for tuberculosis and tetanus varied across the transmission routes listed in the questionnaire. Because the questionnaire did not incorporate a validated knowledge scale or predefined answer key, these findings represent participants' perceptions rather than objectively measured knowledge.

The people asked about tuberculosis and tetanus had different ideas about how these diseases are spread. The problem is that the questionnaire does not have a way to determine if the answers are correct or not. So, we are just reporting what the people said they think, not what is actually true. The fact that people had different ideas about how diseases are spread shows that we need to teach people more, about how to stay healthy at work especially about diseases and how they are spread through blood and other body fluids. We need to make sure that people have the information and know how to prevent getting sick.

Variable	Category	n (%)
Body-fluid splash exposure	**Yes***	**28 (26.2)**
	No*	79 (73.8)
Site of body-fluid splash	Open cut	0 (0.0)
	Mouth	15 (14.0)

Variable	Category	n (%)
	Eyes	7 (6.5)
	Other sites	6 (5.6)
Work-related disease	Typhoid	1 (0.9)
	Diarrhea	0 (0.0)
	Skin rash	2 (1.9)
	No disease reported	104 (97.2)
Method of waste disposal	Dedicated waste bin	29 (27.1)
	Washing and reuse	38 (35.5)
	Other methods	30 (28.0)
Health issue related to chemical exposure	Yes	3 (2.8)
	No	77 (72.0)
	Did not come in contact	27 (25.2)
Inhalation of chemicals	Yes	28 (26.2)
	No	52 (48.6)
	Did not come in contact	27 (25.2)
Skin irritation	Yes	13 (12.1)
	No	94 (87.9)

Table 4: Workplace Safety Incidents and Chemical Exposure among Mortuary Workers (N = 107)

Values are presented as n (%). Percentages represent the proportion of participants reporting each workplace safety incident, chemical exposure, or health condition.

Table 4 summarizes reported body-fluid exposure, work-related health conditions, waste-disposal practices, and chemical-related exposures among the 107 mortuary workers. Overall, 28 (26.2%) participants reported body-fluid splash or exposure, while 79 (73.8%) reported no such exposure. Among the reported exposure sites, the mouth was most frequently involved (15, 14.0%), followed by the eyes (7, 6.5%) and other sites (6, 5.6%); no participant reported exposure through an open cut. Regarding work-related diseases, one (0.9%) participant reported typhoid and two (1.9%) reported skin rash, whereas 104 (97.2%) reported no disease. Waste-disposal practices varied: 29 (27.1%) used dedicated waste bins, 38 (35.5%) reported

washing and reusing items, and 30 (28.0%) used other methods. Chemical exposure was also reported, with 28 (26.2%) reporting inhalation, 13 (12.1%) reporting skin irritation, and three (2.8%) reporting health issues attributed to chemical exposure. These findings are self-reported and do not quantify environmental exposure or establish causality. Objective measurements of chemical concentrations and ventilation were not performed, limiting assessment of the magnitude of occupational hazards.

Variable	Category	n (%)
Protective/isolation gown	**Yes**	**21 (19.6)**
	No	86 (80.4)
Eye goggles	Yes	6 (5.6)
	No	101 (94.4)
Gloves	Yes	68 (63.6)
	No	39 (36.4)
Face mask	Yes	67 (62.6)
	No	40 (37.4)
Workplace injury	Yes	39 (36.4)
	No	68 (63.6)
Cause of injury	Sharps	37 (34.6)
	Chemical splash	1 (0.9)
	Slip/trip/fall	1 (0.9)
	No injury	68 (63.6)
Action after injury	Continued work and reported later	18 (16.8)
	Reported immediately	16 (15.0)
	Continued work without reporting	5 (4.7)
	No injury	68 (63.6)
Management response	Healthcare provided	26 (24.3)
	Self-treatment at own expense	7 (6.5)
	Self-treatment at facility expense	6 (5.6)
	No injury	68 (63.6)
Reason for not reporting	Delayed response	5 (4.7)
	No response	32 (29.9)
	Injury considered minor	2 (1.9)
	No injury	68 (63.6)

Table 5: Personal Protective Equipment Use, Workplace Injuries, and Management Response among Mortuary Workers (N = 107)

Values are presented as n (%). Percentages indicate the proportion of participants reporting the use of personal protective equipment, workplace injuries, injury reporting practices, and management response.

Table 5 presents PPE use, workplace injuries, injury reporting, management response, and reasons for non-reporting among the 107 mortuary workers. Gloves were the most commonly reported PPE item (68, 63.6%), followed by face masks (67, 62.6%), whereas protective gowns (21, 19.6%) and eye goggles (6, 5.6%) were less frequently reported. Overall, 39 (36.4%) participants reported a workplace injury. Sharps injuries were predominant (37, 34.6%), while chemical-splash and slip/trip/fall injuries were each reported by one (0.9%) participant. Regarding injury reporting, 16 (15.0%) participants reported injuries immediately, 18 (16.8%) continued working and reported them later, and 5 (4.7%) continued working without reporting. Among reported management responses, 26 (24.3%) participants received healthcare, while 7 (6.5%) underwent self-treatment at their own expense and 6 (5.6%) received self-treatment supported by the facility. Lack of

response was reported as a reason for non-reporting by 32 (29.9%) participants. These findings indicate gaps in PPE use and timely injury reporting; however, the cross-sectional design does not establish reasons for reporting behavior or causality.

Serological marker	Result	n (%)
HIV	**Non-reactive**	**106 (99.1)**
	Reactive	1 (0.9)
HBsAg	Non-reactive	105 (98.1)
	Reactive	2 (1.9)
Anti-HCV	Non-reactive	106 (99.1)
	Reactive	1 (0.9)

Table 6: Serological screening reactivity for HIV, hepatitis B surface antigen (HBsAg), and anti-hepatitis C virus (anti-HCV) among mortuary workers (N = 107)

Values are presented as n (%). Serological results indicate the number and percentage of participants with rective or non-reactive test results for HIV, hepatitis B surface antigen (HBsAg), and hepatitis C virus (HCV).

Table 6 presents the serological screening findings for HIV, hepatitis B surface antigen (HBsAg), and anti-hepatitis C virus (anti-HCV) among the 107 participating mortuary workers. One participant (0.9%) had an HIV-reactive screening result, two (1.9%) had HBsAg-reactive results, and one (0.9%) had an anti-HCV-reactive result, while the remaining participants had non-reactive results for the respective markers. These findings represent serological screening reactivity and do not establish confirmed infection or occupational acquisition of infection These findings indicate a small proportion of serological screening reactivity within the study population. However, the results should be interpreted cautiously because reactive screening results do not, by themselves, establish confirmed infection unless appropriate confirmatory testing has been documented. Furthermore, the cross-sectional design does not establish the timing or source of any infection and cannot determine whether the observed serological reactivity was occupationally acquired. The study did not include pre-employment baseline testing, a non-exposed comparison group, or longitudinal follow-up. Therefore, these findings should be considered descriptive screening results requiring appropriate clinical confirmation and follow-up rather than evidence of occupational transmission or causation.

DISCUSSION

This study looks at the work-related health traits, safety habits, awareness of diseases reported exposure at work, injuries and some blood test results among people who work in mortuaries in different government district mortuaries spread across areas of Uttar Pradesh. The results show that there are problems with proper training related to health at work using protective equipment understanding the risks at work reporting injuries and following some safety steps at work. But because the places that took part were chosen on purpose and the people who worked there had types of jobs the results should be seen as observations from those specific places not as a true picture of all mortuary workers, in Uttar Pradesh.

Most people in this study had a lot of experience at their jobs with 81 people (75.7%) saying they had been working for than five years but only 16 people (15.0%) said they had gotten formal training on how to stay healthy at work. This is a difference between how long people have been working and how much training they got. It seems like just having a lot of experience at a job does not mean people are really prepared to deal with health issues at work. Other studies have found problems with safety and training for people who work in mortuaries in different places [17,18].. study cannot say for sure if not getting formal training meant people were not safe at work or got hurt. The results might also be different because of the rules at each workplace, who's, in charge whether training is available and what each place normally does.

The occupational roles represented in this study were heterogeneous, with autopsy personnel comprising 44 (41.1%) participants, followed by ward boys [21 (19.6%)], pharmacists [17 (15.9%)], sweepers [8 (7.5%)], computer operators [6 (5.6%)], guards [5 (4.7%)], and other occupational categories. These groups are unlikely to have identical exposure intensity

because their duties differ in relation to cadaver handling, body-fluid contact, sharps exposure, chemical handling, and direct involvement in autopsy procedures. Therefore, the overall estimates should be interpreted as describing the participating mortuary workforce as a whole rather than as a uniform measure of exposure risk for every occupational category. Future studies with larger samples should stratify workers according to direct and indirect exposure or occupational role.

Awareness of infectious diseases was usually high for tetanus and tuberculosis with 106 people or 99.1 percent saying they knew about each of these diseases. However awareness of hepatitis viruses was lower with 68 people or 63.6 percent saying they knew about them. Still people did not think their jobs put them at risk. 30 People or 28.0 percent thought their job could be a risk for hepatitis B.. Only 35 people or 32.7 percent thought their job could be a risk for HIV. 22 People or 20.6 percent said they had tested for HIV after starting their job. These results show that knowing about a disease does not always mean people think it is connected to their work. Similar worries about knowledge and safety practices in the workplace have been found in research with people who work in mortuaries. Because the current questionnaire did not use a known and tested way to measure knowledge these results should be seen as peoples opinions, than a way to measure how much they do not know.

The responses concerning possible routes of disease transmission also demonstrated considerable variation. Needlestick injury was frequently identified as a possible transmission route for hepatitis B [85 (79.4%)] and hepatitis C [90 (84.1%)], whereas responses for other transmission routes varied substantially across diseases. Similar concerns regarding misconceptions about occupational disease transmission have been reported previously [17, 19,20]. These findings support the importance of structured and continuous occupational-health education; however, the present study cannot establish that misconceptions directly resulted in unsafe practices or occupational exposures.

PPE use was not the same for all types of equipment. Gloves [68 (63.6%)] and face masks [67 (62.6%)] were the often-mentioned items while protective gowns [21 (19.6%)] and eye goggles [6 (5.6%)] were mentioned less often. Similar differences in how safety practices were used have been seen among mortuary workers in Nigeria and other places [18,19]. The lower number of reports, about gowns and eye protection might be because of tasks, availability of PPE how much people think they need it how much supervision they get or how things are done at work.. Because this study did not check PPE availability or watch how people used it these ideas are just possible reasons and not proven causes.

Workplace injuries were reported by 39 people, which's 36.4 percent of the participants. Sharps injuries were reported by 37 people, which's 34.6 percent of the total study population. Sharps injuries were the cause of injury that was reported. One person reported a chemical-splash injury. One person reported a slip or trip or fall injury. The fact that sharps-related injuries were the common matches what was found in earlier studies about the dangers faced by people who work in mortuaries [19]. It is important to note that 16 people, which is 15 percent of the participants reported their injury right away. Eighteen people, which is 16.8 percent kept working before they reported the injury. Five people, which is 4.7 percent kept working. Did not report the injury at all. Twenty-nine people, which is 29.9 percent said that there was not response from managers and that is why they did not report the injury. Similar concerns about reporting injuries and making sure safety measures are followed have been mentioned in studies about people who work in mortuaries [19,20]. These results show how important it is to have ways to report injuries that're easy to use and to take care of injuries quickly after they happen. However, the way this study was done which is a -sectional study does not allow us to find out why people choose to report or not report their injuries. It also does not let us prove that there is a cause-and-effect relationship, between how managers respond and people not reporting injuries.

Chemical exposure was another relevant occupational-health concern. In the present study, 28 (26.2%) participants reported inhalation of workplace chemicals, 13 (12.1%) reported skin irritation, and 3 (2.8%) reported a health issue associated with chemical exposure. Previous work in forensic mortuary settings has also identified chemical exposure as an occupational concern [21,22]. The frequency of reported chemical-related health problems in the present study was relatively low; however, direct comparison between studies should be undertaken cautiously because chemical agents, exposure intensity, work practices, ventilation, and outcome definitions may differ between settings. The present study did not objectively measure chemical concentrations, duration of exposure, or ventilation and therefore cannot quantify the magnitude of environmental chemical exposure.

The findings concerning waste-disposal practices also indicate variation in workplace practices. Twenty-nine (27.1%) participants reported using dedicated waste bins, whereas 38 (35.5%) reported washing and reusing materials. Similar

concerns regarding mortuary waste management and occupational safety have been reported previously [6,12]. These findings emphasize the importance of standardized biomedical-waste management procedures and appropriate occupational-safety infrastructure. Nevertheless, because waste-disposal practices were self-reported and facility-level environmental assessment was not undertaken, the findings should not be interpreted as a direct assessment of compliance with prescribed waste-management standards.

The findings about immunization need to be understood. In Table *1* it says that 64 people, which is 59.8 percent of the participants said they got immunized.. The original Abstract said 69 people, which is 64.5 percent got the hepatitis B vaccine. This was not correct. The new version of the manuscript fixes this by not saying "completed vaccination" unless we have the records that show what kind of vaccine how many doses and if it was finished. So this study is really about what people said about their immunization not about how many people got vaccinated. Better records and vaccination programs at work might still be important for keeping people healthy at work. The immunization findings are important to consider. This study provides information on the immunization status that people reported which is, about the immunization.

The results of the blood tests need to be looked at carefully. The tests found one person with a result for HIV, two people with positive results for HBsAg and one person with a positive result for anti-HCV. This means that some people had things in their blood but it does not mean that they got sick because of their job in the mortuary.

The present study identified a small number of reactive serological screening results, including one (0.9%) HIV-reactive result, two (1.9%) HBsAg-reactive results, and one (0.9%) anti-HCV-reactive result among the 107 participants. These findings should be interpreted cautiously as screening reactivity rather than confirmed infection unless appropriate confirmatory testing has been documented. Furthermore, the cross-sectional design does not establish the timing or source of any infection and cannot determine whether the observed serological reactivity was acquired occupationally. The study did not include pre-employment baseline testing, a non-exposed comparison group, or longitudinal follow-up. Therefore, the observed serological reactivity cannot be attributed to occupational exposure. The findings should instead be considered descriptive screening results that may warrant appropriate clinical confirmation, counselling, and follow-up according to applicable testing procedures. This distinction is important because HIV, HBV, and HCV may be acquired through multiple occupational and non-occupational routes, and the present study was not designed to establish occupational transmission. So when we talk about the results of the blood tests, we should say that people had test results rather than saying that they got sick because of their job. We should look at the results in the context of what people were exposed to at work than thinking that it proves they got sick because of their job. If people had test results it may be a good idea for them to get checked and get help but it does not mean that they got sick because of their job. This is important because people can get HIV, HBV and HCV in ways that have nothing to do with their job.

The results of the blood tests for HIV, HBV and HCV should be considered carefully. The presence of test results for HIV, HBV and HCV may be useful, for making sure that people get the help they need but it cannot prove that they got sick because of their job. The difference is important because HIV, HBV and HCV can be acquired in ways that are not related to work.

The results of this study can be looked at with international research. Usman et al. [17] Found that mortuary workers in Kaduna, Nigeria had a good understanding of the dangers they face at work and the safety rules they should follow. This study showed that there is a big difference between what people know about diseases and how they actually keep themselves safe. This could be because the workplaces are set up differently with rules and equipment available. Some other researchers, like Obiechina and Pobari [18] and Emmanuel and Police [20] also found that mortuary workers have safety concerns. This shows that having a plan in place to keep workers safe is really important. Okoth-Okolloh et al. [21] Said that having ways of doing things and making sure people follow them can make a big difference, in keeping workers safe. Looking at all these studies together can be helpful. We should not think that just because something works in one place it will work the same way in another place.

The current results also matter for health policies in funeral homes. The mix of formal education different ways of using safety clothes people saying they got cut waiting to report injuries and different ideas about getting sick suggests some areas where things could be better. These areas include health training having the right safety clothes available clear ways to report injuries checking after an exposure keeping track of vaccines and handling medical waste properly. These ideas are about

preventing problems and making programs better. They should not be seen as proof that the problems caused the injuries or the test results.

Another thing to think about is how the funeral homes were chosen. Even though people were picked from 18 areas the places themselves were chosen on purpose. People working in the place might have similar access to safety clothes how they are managed chances for learning how waste is handled how busy they are and how they report injuries. Because of this what people in the place say might not be separate from each other. The study was about describing things and did not do enough to deal with groups of people from the same place in the math part. This makes it hard to be sure about what's true for the place and makes it harder to use the results in other places. This should be fixed in studies, with better ways to choose people and do the math.

The results of this study are similar to what other studies have found. Occupational health training and the use of protective equipment are still big concerns for people who work in mortuaries. We also know that reporting injuries and being aware of diseases are important. The mortuaries need to have safety systems in place.

This study only looked at a thing that can affect the health of people who work in mortuaries that are run by the government. It did not look at all the health risks. There are things that we did not look at, such as musculoskeletal disorders, respiratory symptoms and psychological health. We also did not check if the mortuaries had the protective equipment or if the workers had been vaccinated.

LIMITATIONS

There are limitations in studying temporality and causality due to cross-sectional study design. There could be a limitation in generalizability of the results from purposive sampling. Recall or reporting bias might be possible in self-reports of exposure, usage of personal protective equipment, work-related injuries, and immunization status. Results of the serology only indicate screening reactivity but cannot confirm occupational acquisition of infection. Chemical exposure and ventilation of the workplace were not objectively assessed.

CONCLUSIONS

This study looked at the occupational risks faced by mortuary workers in Uttar Pradesh. It found that workers do not always receive adequate training to stay safe at work or consistently use protective equipment. The study also found that some workers experience workplace injuries and may be exposed to infections such as HIV and hepatitis.

The study found that a few workers had reactive test results for HIV, hepatitis B, and hepatitis C. This does not mean that they got these infections from their work. The study shows that mortuary workers need proper safety training and protective equipment. They also need clear ways to report injuries and access to appropriate medical care after possible exposure. Vaccination against diseases such as hepatitis B should also be encouraged among mortuary workers.

Future studies should use standardized methods and assess working conditions consistently across mortuaries. They should also use appropriate tests to identify infections and collect clear information on workers' vaccination status. Mortuaries in Uttar Pradesh need to do more to protect their workers by providing a safe working environment, appropriate protective equipment, and proper training.

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