

Research article

Awareness of occupational risks, infection control practices and HIV antibody status among funeral industry workers in Sri Lanka

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Abstract

Introduction and Objectives: Funeral industry workers are at occupational risk of exposure to numerous infections. The study aimed to assess the knowledge, attitudes and practices on infection control and investigate the presence of HIV antibodies among funeral industry workers in the Western Province of Sri Lanka.

Methods: Seventy funeral industry workers who had dealt with at least a single cadaver were included in the study. An interviewer administered questionnaire was used to collect data on aspects of infection control relevant to cadaver handling. Knowledge was assessed using 44 questions while attitudes and practices were assessed using 13 and 25 questions respectively. An average correct score of $\geq 75\%$ was considered as good, 74%-50% as moderate and $< 50\%$ as poor. HIV antibody status of the study group was investigated using a rapid immunochromatographic assay.

Results: The participants had an overall moderate knowledge of 52%, poor attitudes (42%) and moderate practices (53%) regarding infection control. Only 53% and 23% knew that HIV and HBV infection respectively can be transmitted through cadavers. Further, although the attitudes of 51% were that cadavers carry a risk of infection, no one had good attitudes on compulsory use of all protective equipment. However 84% claimed to use gloves during embalming. Vaccination for Hepatitis B and tetanus was reported in 10%. None had received formal training in cadaver handling. No participants were positive for antibodies against HIV.

Conclusions: The funeral industry workers had moderate knowledge (52%), moderate practices (53%) and poor attitudes (42%) suggesting that implementation of formal training programs and guidelines on embalming practices are needed.

Keywords: Funeral industry workers, Sri Lanka, Infection control

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Introduction

Embalming is conducted to help preserve the body and prevent the spread of infection both before and after burial.¹ The process includes draining of blood, abdominal and thoracic cavity fluids and removal of internal organs, depending on the type of embalming undertaken, thus exposing the involved individual to an extensive amount of clinical waste. Clinical waste pose an important infectious hazard for those involved in handling them. The funeral industry workers are a neglected occupational group in developing countries such as Sri Lanka. Funeral industry workers include embalmers, embalming assistants, drivers and other support staff, who handle cadavers and thereby come in contact with potentially infectious clinical material on a daily basis.

A number of bacterial and viral pathogens can survive in the cadavers and be transmitted through infected body fluids or aerosols and cause infection. Among them are important infectious agents such as *Mycobacterium tuberculosis*, hepatitis B and C viruses and HIV.¹ Cut and prick accidents as well as blood or other body fluids coming in contact with mucous membranes serve as modes of transmission of blood borne infections including HIV and HBV. Aerosol generation during such work has been implicated in transmitting air borne infections such as tuberculosis.¹

In most developed countries, embalming is a regulated occupation. They not only possess guidelines, but also have a systematic training procedure which also involves licensing of those functioning in the industry.² Collectively these measures have led to a reduction in infection risks within the funeral industry worker population. However in Sri Lanka, the funeral industry is unregulated and devoid of guidelines, systematic training opportunities in cadaver handling and infection control.

To the best of our knowledge, investigation of the occupation hazards that face funeral industry workers in Sri Lanka has been neglected. This study aims to assess the knowledge, attitudes and practices on infection control and investigate the presence of HIV antibodies among funeral industry workers in the Western Province of Sri Lanka.

Subjects and Methods

A descriptive cross sectional study was carried out in 2014 among seventy individuals working in the funeral parlours of the Western Province of Sri Lanka. Convenience sampling was used by visiting funeral parlours located near hospitals in the Western Province, as there is no regulatory authority to obtain information on the number and location of funeral parlours in the country. Funeral industry workers including embalmers, their helpers and employers of embalmers who had been involved in embalming of at least one cadaver were included in the study. Individuals less than 18 years of age and individuals who have never directly participated in the embalming process were excluded.

A 5ml blood sample was collected from each participant for serological analysis after obtaining informed written consent. The serum was tested for presence of anti HIV antibodies by

immunochromatographic assay (Alere Determine HIV -1/2 test kit) following the manufacturer's instructions. The test was considered as positive if a visible line developed in the test area as well as the control area.

A questionnaire was used to collect data on knowledge, attitudes and practices as well as availability of facilities for infection control. The questionnaire was validated by pretesting on a group of ten funeral industry workers as a pilot study. The ambiguous questions were identified and modified or removed to improve simplicity and ease of understanding.

The questionnaire consisted of four parts. Demographic information such as age, gender, specific occupation, years of working in the funeral industry and number of bodies embalmed was collected. Knowledge, attitudes and practices were assessed under the following three major categories: General infection control (32 questions), Hepatitis B (27 questions) and occupation related accidents (17 questions). Participants were also questioned on exposure to Rabies and Human Immunodeficiency Virus (HIV) which in addition to Hepatitis B pose a considerable occupational threat to funeral industry workers.¹ Practices assessed included information on aspects such as routine use of gloves and disposal of clinical waste. Satisfaction with the availability of facilities (eg: availability of soap/disinfectants) in the work place was also obtained.

The investigators interviewed individual participants after obtaining written consent. Overall knowledge, attitudes and practices and satisfaction with facilities was assessed for each individual using a scoring system (1 for correct knowledge, good attitudes, correct practices and satisfaction with facilities, while 0 for incorrect knowledge, poor attitudes, incorrect practices and dissatisfaction with the availability of facilities for embalming). The average score of each category (knowledge, attitudes, practices and satisfaction with facilities) were used to calculate the percentage of each category. A percentage score of $\geq 75\%$ for knowledge, attitudes, practices and satisfaction with available facilities was considered as good, 50-74% for knowledge and satisfaction of facilities, attitudes and practices was considered as moderate while less than 50% was considered as poor.³ Chi square test was used as a tool for testing the hypothesis of whether possession of good knowledge (>50 score) or poor knowledge (< 50 score) had an effect on the use of personal protective equipment and disposal of clinical waste. A p value ≤ 0.05 was considered as significant.

Ethical clearance for the study was obtained from the Ethics Review Committee of the Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka (HB1/14).

Results

The survey included 70 participants of whom 41 (59%) were identified as funeral workers and the remaining 29 (41%) as helpers of embalmers. The mean time for questionnaire completion was thirty minutes. A majority (96%) of participants functioned in private enterprises while 3 (4%) practiced embalming in a state owned non-profit organization. Eighteen funeral parlours from the Gampaha District and 6 Funeral parlours from the Colombo district were included in

the study. All study subjects were males, with a majority (n=52, 74%) in the age range 30-59 years.

Of the study subjects, 43 (61%) individuals claimed to have dealt with more than 3000 bodies during their period of service. When considering those directly involved in embalming (n= 41, 59%), the mean number of bodies embalmed was 4346 (SD 3376). A normal distribution was not observed with regard to number of bodies embalmed, probably due to the social stigma associated with this occupation and persons joining the occupation being few. Further a tendency for the occupation to be passed from one generation to another was also seen. Those already in the industry remained as funeral workers for long periods with the majority (n=47, 67%) of study subjects spending more than 10 years in their current occupation (mean 8 ± SD 3).

Tables 1-3 demonstrate the knowledge of embalmers and helpers in risk activities of their occupation.

Table 1 Knowledge on general infection control, Hepatitis B and occupational accidents

Knowledge on	Specific question	Positive response	
		No	%
Infection risk of embalming	Is embalming a health risk?	43	61
	Through body fluids of the deceased	49	70
	Through instruments used for embalming	59	84
Mode of transmission	Blood splashes to eyes or mouth	47	67
	Cuts by instruments used to handle cadavers	32	46
	Exposure of damaged skin to body fluids	54	77
	Touching the cadaver with bare hands	52	74
Likelihood of occupational accidents	Consuming food, beverages or cigarettes while dealing with cadaver	50	71
	Possibility during embalming	30	43
Infectious agents that could be transmitted during cadaver handling	HIV	37	53
	Tuberculosis	38	54
	HBV	16	23
Contraindications to embalming	Rabies infected bodies	24	34
	HIV infected bodies	15	21
No contraindication to embalming	Cadavers with cancers	64	91
Hepatitis B	General	42	60
	Transmission and symptoms	29	41
	Availability of Hepatitis B vaccine	04	06

Table 2 Routes of disease transmission as identified by Embalmers (n=41) and their helpers (n=29)

Route of transmission	Number of embalmers with correct knowledge		Number of helpers of embalmers with correct knowledge	
	n	%	n	%
Cuts by instruments used to handle the cadaver	24	59	8	28
Blood splashes to eyes/mouth	33	80	14	48
Exposure of damaged skin to body fluids of cadaver	37	90	17	59
Consuming food/alcohol/cigarettes while handling deceased	33	80	17	59

Table 3 Knowledge/practices of embalmers (n=41) and helpers (n=29) with regard to cadavers diagnosed with specific infectious diseases contraindicated for embalming

Disease	Number of individuals with correct knowledge				Number of individuals claiming involved in embalming			
	Embalmers		Helpers of embalmer		Embalmers		Helpers of embalmer	
	n	%	n	%	n	%	n	%
HIV	10	24	5	17	13	32	2	7
HBV	6	15	1	3	10	24	5	17
Rabies	18	44	6	21	10	24	6	21

Table 4 provides data on beliefs and attitudes of the study group on infection control.

Table 4 Beliefs and attitudes of study group on infection control practices in the funeral industry n=70

Belief/attitude	Positive response	
	n	%
All cadavers carry an infection risk	36	51
Necessity		
for protective equipment (disposable glove, facemask, waterproof apron and chemical proof boots) during the routine embalming process and cadaver handling	100	100%
to cover wounds or abrasions prior to embalming	52	74
to wash hands following cadaver handling	70	100
to obtain medical advice following a cut/prick/blood splash accident	03	04
to immediately be wash with soap and hot running water if skin contaminated with blood/body fluids	8	12
to wear full protective clothing when handling cadavers infected with HIV/HBV	30/7	43/10
for hepatitis B vaccination	15	21
to regularly clean embalming hall to reduce infection risk	35	70

Of the participants 16 (23%) individuals claimed to have embalmed cadavers suspected of rabies and 15 (21%) stated they had embalmed cadavers diagnosed with HIV and a similar number (21%) had embalmed cadavers diagnosed with HBV at least once during their career. The information on the infection status of the deceased had been verbally communicated to the embalmers or helpers from family members of the deceased

Table 5 Infection control practices by embalmers and their helpers

Infection control practice		Positive response	
		n	%
Compliance with good practice			
Wash hands	following cadaver handling	70	100
	thoroughly with soap after embalming		
Shower following embalming		64	91
Wash immediately with soap and hot running water if skin contaminated with blood/body fluids		07	10
Cover wounds or abrasions prior to embalming		52	74
Obtain medical advice following a cut/prick/blood splash accident		03	04
Wear full protective clothing when handling cadavers infected with HIV/HBV		30	43
Use disposable gloves		59	84
Use goggles		9	13
Use boots and apron		05	07
Use long water proof aprons / non slip chemical proof boots		0	0
Cleaning of embalming hall	regularly clean embalming hall to reduce infection risk	49	70
	daily cleaning	68	97
	disinfect blood spills prior to cleaning	12	17
	Use phenol based detergents	45	64
	Use hypochlorite solutions	01	01
Alcohol consumption (while at work)		13	19
Consume water and other beverages		17	24
Consume food		5	7
Smoke during embalming		9	13

Disposal of solid waste by burning was reported to be practised by 63% of embalmers, while 51% reported incineration, which were acceptable practises as per guidelines.⁴ The liquid waste was drained to a septic tank by 68%. However three individuals stated that body fluids were drained to common water drainage systems (Table 6)

Table 6 Methods of clinical waste disposal as identified by Embalmers (n=41) and their helpers (n=29)

Clinical waste disposal	Embalmer		Helper of embalmer	
	n	%	n	%
Disposal of solid waste				
Buried in cemetery	26	63	10	34
Incinerated	21	51	4	14
Other	4	10	5	17
Disposal of fluid waste				
Drained to septic tank	28	68	12	41
Incinerated	5	12	7	24
Drained to common drainage system	2	5	1	3

Table 7 Effect of knowledge on practice

	participants with good knowledge n=26		participants with poor knowledge n=44		p Value
	n	%	n	%	
Use of disposable gloves	26	100	33	75	0.005
Use of face mask	5	19	4	9	0.221
Use of water proof apron	3	11	2	5	0.272
Correct disposal of solid clinical waste	22	85	39	89	0.627
Correct disposal of liquid clinical waste	20	77	20	45	0.01

Table 7 shows that having good or moderate knowledge (>50 score) compared with poor knowledge (< 50 score) had an significant effect on practices such as using gloves and disposal of clinical waste

All 70 (100%) individuals stated that they received adequate soap or detergent as well as disposable gloves and 69 (99%) stated that they were provided with fully equipped washrooms for their personal cleaning purposes. The majority (n=61, 87%) also stated that they were provided with adequate amounts of disinfectants. Availability of personal protective equipment such as heavy duty gloves, boots, masks were poor. Anti HIV1 and 2 antibodies were undetectable in all serum samples tested.

It is important to note that none of the individuals had received formal training or provided with guidelines with regard to their occupation.

Discussion:

Funeral industry workers involved in embalming and cadaver handling as part of their occupation are vulnerable to exposure to various infectious agents from the cadavers they handle. Awareness of these risks and adherence to good practices with regard to infection control is crucial for those working in this industry. All study subjects investigated in this study were males. Low social acceptance and cultural marginalization of the industry could be thought as reasons for the lack of female participation in the industry.

Participants in the study were questioned on three important viral infections: HIV, Hepatitis B and rabies. Transmission of HIV and Hepatitis B through infected body fluids is well documented, while transmission of rabies has been rarely reported through contamination of mucous membranes of eyes, nose and mouth^{4,5}. Prolonged stability of HBV within the cadavers' microenvironments and the highly infectious nature of rabies make these diseases of particular risk to those handling them and thus all present guidelines on embalming contraindicate embalming of cadavers diagnosed with HIV, HBV and rabies^{4,5}.

The participants in this study lacked knowledge on routes of disease transmission which was consistent with the work of Kelly et al 2011⁷. However, in contrast to this which reported that 58% of Irish morticians claimed to have embalmed bodies suspected of blood borne viruses, the number of individuals who claimed to have embalmed bodies suspected or diagnosed of HIV, HBV and rabies in the present study was low (32% and 24% respectively). However, the lack of relevant knowledge raises concerns on the lack of education and proper training in infection control for workers in the funeral industry of Sri Lanka.

While all study participants recognized that use of gloves and hand washing following embalming and cadaver handling was important in minimizing disease transmission, alarmingly none of them realized the need for compulsory use of all protective equipment including disposable gloves, facemask, waterproof apron and chemical proof boots. The results in this study differ significantly from the work of Oguntona et al. (2012)⁸ where 81% possessed good attitudes toward the compulsory use of gloves whereas in the present study it was 100%. Only 19% and 11% recognized the importance of face masks and water proof apron respectively in safeguarding their health during embalming and cadaver handling.

In the current study, pricks were identified as the most common accident occurring during embalming followed by cuts, blood splashes and formalin related accidents by the embalmers. Similar work by Gershon et al. (1998)⁹ reports skin contact with blood as the most common type of accident among embalmers. This was followed by needle stick injuries, splashes of blood to eyes and mouth and cuts or pricks in decreasing order of importance.

A majority in our study adhered to acceptable practices with regard to waste disposal which is a favourable finding, similar to many other countries which have well established waste disposal systems^{1,7}.

The participants of the study were satisfied with the general facilities available for embalming including soap and detergents (100%) and fully equipped washrooms for their personal cleaning purposes (99%) except for other personal protective equipment such as overall basic suit (10%). In contrast, Kelly et al. (2011) ⁷ report that 89% of embalmers claimed to receive dedicated facilities for embalming.

None of the study participants were found to be HIV antibody positive, possibly due to the low prevalence (<0.1% of adult population) of HIV in Sri Lanka ¹⁰ and the reportedly poor stability of the HIV in cadavers ¹¹. Five participants were found to be positive for Anti HBs (unpublished data) on later investigation although none of them claimed to have received vaccination for Hepatitis B. Funeral industry workers engaged in embalming are more at risk of occupational exposure to infections due to multiple factors including greater level of exposure to body fluids and extended period of exposure to clinical waste. Although effective prophylactic measures for Hepatitis B are available, the funeral industry workers in this study had an unacceptably poor rate of vaccination for Hepatitis B (8.6%). The poor socioeconomic status, education level, unavailability of formal training programmes and vaccination facilities could be important contributory factors to the poor vaccination rates. One limitation of this study was that Hepatitis B surface antigen levels could not be determined in this population which could indicate the current infection status. Further, the study only collected data on occupational risk of viral transmission. Thus a limitation in this study is that other modes of transmission such as sexual transmission, transmission via blood and blood products were not investigated.

The lack of awareness on good practices and poor knowledge observed among the Sri Lankan study population could be attributed to the unavailability of guidelines applicable to the local context. The study strongly highlights the need for health education and training programmes for funeral industry workers, ideally through a government institution under the Ministry of Health providing both theoretical as well as practical knowledge through different approaches including workshops and seminars. The need for regulation of the industry, including licensing of funeral industry workers and the formulation of guidelines with regard to infection control aspects of embalming and cadaver handling that is relevant to the local setting is also highlighted.

Conclusion

The funeral industry workers had moderate knowledge (52%), moderate practices (53%) and poor attitudes (42%) regarding infection control and a poor use of personal protective equipment highlighting the need to improve awareness, practices and availability of facilities for personal protection from infection in this occupational risk group.

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