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ORIGINAL ARTICLE

Frequency and risk factors of bloodborne infectious diseases among informal solid waste handlers: A cross-sectional study.

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ABSTRACT… Objective: To determine the frequency and risk factors of bloodborne infectious diseases among informal solid waste handlers. **Study Design:** Cross-sectional Analytical study. **Setting:** Marghzar Colony, Lahore, Pakistan. **Period:** October to November 2019. **Material & Methods:** Convenience enrollment of 101 informal solid waste handlers out of total 150 invited subjects resulted in a response rate of 67.3%. A predesigned proforma was administered to collect demographic and clinical information. Whole blood specimen collected for subsequent screening of hepatitis B, hepatitis C & human immunodeficiency virus by rapid immunochromatographic test. Crosstabs analysis performed to calculate the odds ratios for bloodborne infectious diseases and chi square test used to find the association between risk factors and bloodborne infectious diseases. **Results:** Mean age of study population was 31.9±12.8 years. Participation of females 65.3% was higher than males 34.7%. Overall 4.0% frequency of bloodborne infectious diseases included 2.0% hepatitis B and 2.0% hepatitis C. None of the respondents had HIV or co-infection of hepatitis B and C. Frequency of those who collected waste from clinical sites was 6.0%, who received sharps injuries (100.0%), and who never used personal protective equipment (100.0%). Gender male [OR=6.094; 95.0% CI, 0.609–60.927], smoking [OR=5.056; 95.0% CI, 0.454–56.245], and waste collection from clinical site [OR=6.133; 95.0% CI, 0.537–70.057] showed a higher risk of bloodborne infectious diseases. **Conclusion:** The proportions of hepatitis, sharps injuries and not using personal protective equipment were high among informal solid waste handlers. Waste collection from clinical sites showed higher risk of occupational transmission of hepatitis.

Key words: Blood-borne Infections, Hepatitis, Needlestick Injuries, Pakistan, Solid Waste.

INTRODUCTION

Bloodborne infectious diseases such as acquired immunodeficiency syndrome (AIDS), hepatitis B and hepatitis C are serious public health problems around the globe. Estimated 37.7 million people with human immunodeficiency virus (HIV) infection[1], 296.0 million with chronic hepatitis B[2], and 58.0 million with chronic hepatitis C live in the world.[3] In general population of Pakistan, the respective burden of hepatitis B and C was 2.5% and 4.9% in 2008[4], and estimated prevalence of HIV is 0.2% in adults of age 15-49 years.[5] The needlestick and sharps injuries are the most common source for occupational transmission of bloodborne infectious diseases[6], and is often noticed in the healthcare settings especially in emergency and operation room.[7]

In Pakistan, thousands of tons of solid waste is generated each day; however, 51 – 69% of the total waste is collected by the respective municipality.[8] Estimated 90 thousands scavengers collect recyclable items from garbage to meet their living expenses in the country.[9] While, infectious waste segregation, storage and transportation practices are suboptimal.[10] Hence, municipal waste workers and informal solid waste handlers are exposed to the risk of having bloodborne infectious diseases through needlestick and sharps injuries during collection and sorting of solid waste.[11] However, very little is known about the health status of local scavengers. Therefore, the study aimed to determine the frequency and risk factors of bloodborne infectious diseases among informal solid waste handlers.

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MATERIAL & METHODS

The cross-sectional analytical study was carried out at Marghzar Colony in Union Council (UC) 109 of Lahore district between October and November 2019. The Lahore Waste Management Company (LWMC) is responsible for collection and disposal of solid waste, but the company with more than 10,000 field staff covers only 68 out of 150 UCs of Lahore.[12]

A sample size of 38 was calculated using the expected prevalence rate 2.5% of hepatitis B; and 72 calculated using the expected prevalence rate 4.9% of hepatitis C in general population of Pakistan[4], with 95.0% confidence level and 5.0% margin of error. Considering the larger sample size of 72 subjects, total 101 informal solid waste handlers were enrolled in the study by non-probability convenience sampling technique.

Informal solid waste handlers included both male and female subjects, of any age group, who were residents of Marghzar Colony Lahore and were collecting solid waste from houses, shops, barbers, beauty parlors, clinics and pharmacies for last five years.

A purpose-built interviewer-administered questionnaire was used to collect demographic and clinical information. The variables under investigation were age, gender, education, smoking, comorbidity, drug use, history of any medical procedure, family history of hepatitis B & C, garbage collection site, use of personal protective equipment (PPE), and injury during garbage collection. The Combo Rapid Test Cassette was used for onsite screening of hepatitis B virus (HBV), hepatitis C virus (HCV) and HIV.

Statistical Package for Social Sciences (SPSS) version 26.0 used to enter and analyze the data. Mean and standard deviation calculated for numerical variables. Frequency and percentage calculated for categorical variables. Bar chart used for the presentation of risk factors. Crosstabs analyses were performed to calculate the odds ratios (OR) for bloodborne infectious diseases. Chi square test was used to find the association between risk factors and bloodborne infectious diseases. P-value ≤ 0.05 was considered as significant.

The Ethics Review Committee of Institute of Public Health Lahore Pakistan approved the study vide letter No. 09 N&D/IPH dated 6th April 2022. Written informed consent was obtained from all volunteer participants.

RESULTS

A total of 101 informal solid waste handlers participated in the study. Their mean age was 31.9±12.8 years ranged from 12 to 70 years. Young adults (52.5%) had the highest frequency of participation, followed by middle-age adults (36.6%), adolescents (8.9%) and old-age adults (2.0%). The frequency of females (65.3%) was twice higher than of males (34.7%). Only 12.9% study participants were literate and 6.9% cigarette smokers. Hypertension (HTN) alone (22.8%) was the most frequent comorbid non-communicable disease (NCD), followed by HTN with diabetes mellitus (DM) (10.9%) and DM alone (6.9%), see Table-I.

Overall 4.0% frequency of bloodborne infectious diseases included 2.0% hepatitis B and 2.0% hepatitis C. None of the respondents had HIV or co-infection of hepatitis B and C, see Table-I.

		Frequency (%)
Age	>35 years	39 (38.6%)
	≤35 years	62 (61.4%)
Gender	Male	35 (34.7%)
	Female	66 (65.3%)
Education	Literate	13 (12.9%)
	Illiterate	88 (87.1%)
Smoking	Yes	07 (6.9%)
	No	94 (93.1%)
Comorbid NCDs	Yes	41 (40.6%)
	No	60 (59.4%)
HBV infection	Yes	02 (2.0%)
	No	99 (98.0%)
HCV infection	Yes	02 (2.0%)
	No	99 (98.0%)
HIV infection	Yes	0 (0.0%)
	No	101 (100.0%)

Table-I. Characteristics of study population and frequency of bloodborne infectious diseases

Frequency of Risk Factors

The frequency of respondents who collected waste at clinical sites was 6.0%, who got sharps injuries was 100.0%, and who never used PPEs was 100.0%. Moreover, 38.6% reported a positive history of a medical procedure, 16.8% family history of HCV infection, and 2.0% reported drug abuse, see Figure-1.

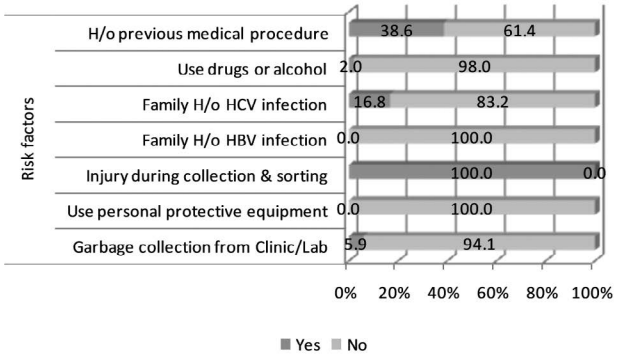

Figure-1. Frequency of risk factors of bloodborne infectious diseases

Risk Factors Associated with Hepatitis

The collection of waste from clinical sites [OR = 6.133; 95.0% CI, 0.537 – 70.057] and males [OR = 6.094; 95.0% CI, 0.609 – 60.927] had 6.0 time higher risk for having hepatitis. Cigarette smokers [OR = 5.056; 95.0% CI, 0.454 – 56.245] had 5.0 time higher risk for having hepatitis. Literates [OR = 2.361; 95.0% CI, 0.227 – 24.572], family H/o HCV infection [OR = 1.688; 95.0% CI, 0.165 – 17.272], and age >35 years [OR = 1.622; 95.0% CI, 0.219 – 12.010] also showed higher risk for hepatitis. The respondents reporting H/o previous medical procedure or using drugs showed a protective effect against having hepatitis. However, the distribution of hepatitis was not significantly different between groups under investigation, see Table-II.

DISCUSSION

The needlestick and sharps injuries are the most common sources for occupational transmission of bloodborne infectious diseases in healthcare workers.[7] Due to improper disposal of clinical waste, a similar risk is posed to the waste workers during collection and sorting of solid waste.[11] When prevalence of bloodborne infectious diseases was compared between waste pickers and non-waste pickers, it was revealed that waste pickers had higher occurrence of hepatitis B and C than non-waste pickers.[13]

		Hepatitis		OR (95% CI)	P-Value
		Reactive	Non-reactive		
Age (years)	>35	5.1%	94.9%	1.622 (0.219 – 12.010)	0.639
	≤35	3.2%	96.8%		
Gender	Male	8.6%	91.4%	6.094 (0.609 – 60.927)	0.119
	Female	1.5%	98.5%		
Education	Literate	7.7%	92.3%	2.361 (0.227 – 24.572)	0.429
	Illiterate	3.4%	96.6%		
Smoking	Yes	14.3%	85.7%	5.056 (0.454 – 56.245)	0.253
	No	3.2%	96.8%		
Drug use	Yes	0.0%	100.0%	–	1.000
	No	4.0%	96.0%		
H/o previous medical procedure	Yes	2.6%	97.4%	0.518 (0.052 – 5.160)	1.000
	No	4.8%	95.2%		
Family H/o HCV infection	Yes	5.9%	94.1%	1.688 (0.165 – 17.272)	0.527
	No	3.6%	96.4%		
Garbage collection site	Clinic/Lab	16.7%	83.3%	6.133 (0.537 – 70.057)	0.220
	Household	3.2%	96.8%		

Abbreviations: OR – odds ratio; H/o – history of; HCV – hepatitis C virus

Table-II. Risk factors associated with incidence of bloodborne infectious diseases

Furthermore, several studies compared the prevalence rate of HBV infection between scavengers and municipal waste workers; and established that scavengers had higher prevalence of HBV infection than municipal waste workers.[14-16] These findings showed that risk of having bloodborne infectious diseases further increases in informal waste workers.

The present study was aimed to determine the burden and risk factors of hepatitis B, C & HIV infection among local informal solid waste handlers and total 4.0% respondents were diagnosed as reactive for bloodborne infectious diseases. Among them, 2.0% respondents had hepatitis B, 2.0% hepatitis C 2.0%, and 0.0% HIV. These results show that frequency of bloodborne infectious diseases estimated in the present study is lower than of prevalence rates reported in other studies from Pakistan. A higher frequency of hepatitis 12.9% was estimated in refugee scavengers of Gujarat Pakistan[17], hepatitis B 4.0% and hepatitis C 28.0% in waste handlers of Bahawalpur Pakistan[13], and hepatitis B 18.8%, hepatitis C 8.5%, and HIV infection 0.85% in male garbage scavengers of Karachi Pakistan.[18] However, it was almost equivalent to 1.5% hepatitis B in municipal waste workers of Egypt[19], half of 4.3% hepatitis B in waste pickers of Latin America[20], and lower than 9.1% hepatitis B and 0.7% hepatitis C in municipal waste workers of Greece.[21]

PPEs are used to build a protective barrier between a worker and hazards in the workplace. However, all respondents (100.0%) reported that they do not use any PPE. When compared, though unsatisfactory, other studies demonstrated little higher proportion of scavengers who use PPEs. The rate of PPEs use was 16.0% in scavengers of Karachi Pakistan[18], and 8.3% to 35.0% in scavengers of Nigeria.[14-16] All respondents (100.0%) also reported that they had a needlestick and/or sharps injuries during collection of waste. Whereas, a lower incidence rate of sharps injuries was reported in other studies from Pakistan and abroad. It was 80.6% in scavengers of Gujarat Pakistan[17], 71.0% in Bahawalpur Pakistan[13], 54.0% in Karachi Pakistan[18], 68.7% in Latin America[20], and 66.2% in Nepal.[22]

Pantazi et al. reported that risk of hepatitis was independently associated with increasing age, marital status, alcohol consumption and smoking in Greece.[21] Sawyerr et al. found a significant association of hepatitis risk with garbage scavenging and avoiding PPE use.[14] Yusuf et al. also found significant associations between incidence of hepatitis and old age, being male, collecting clinical waste, and not using PPE.[15] Although, the association between factors under investigation and risk of occupational transmission of hepatitis was not significant; but age >35 years, being male, smoking, family H/o HCV infection, and collecting waste from clinical sites were revealed as risk factors of hepatitis in the present study.

CONCLUSION

The proportions of hepatitis, sharps injuries and not using personal protective equipment were high among local informal solid waste handlers. Waste collection from clinical sites showed higher risk of occupational transmission of hepatitis. Proper disposal of infectious waste and use of PPEs can reduce the risk of blood-borne infections through needlestick and sharps injuries.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Aalia Khalil	Conceived and designed the study.	
2	Muhammad Adnan	Performed data analysis and interpretation.	
3	Fareeda Nasir Khan	Supervised the performed data collection & interpretation.	
4	Muhammad Umar Farooq	Performed data entry and interpretation critically reviewed and revised the manuscript.	