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Prevalence of Hepatitis C Virus Antibodies among Municipal Solid Waste Collectors in Mansoura, Egypt

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Abstract

Objective: To estimate the prevalence of Hepatitis C virus (HCV) antibodies and the associated risk factors among municipal solid waste (MSW) collectors.

Methods:A descriptive cross-sectional study was conducted upon MSW collectors (n=120) working in the Western Municipality of Mansoura city, Egypt. The collectors were interviewed to collect socio-demographic and occupational data, use of personal protective measures and different risk factors for exposure to infected blood. Blood specimens were collected and tested for HCV antibodies using ELISA technique.

Results: A high prevalence (43.3%) of HCV antibodies was found among MSW collectors. The older age and the longer duration of employment of collectors were statistically significant demographic variables for HCV antibodies sero-positivity. Logistic regression analysis showed that the shorter duration of employment as waste collector was independently associated with lower likelihood of HCV antibodies seropositivity (OR = 0.3).

Conclusion: MSW collectors are at increased risk for HCV infection. MSW collectors should be provided with the necessary protective measures, education and training programs, and routine medical check-up should be implemented and maintained, to keep them safe and secure.

Keywords: Municipal solid waste collectors; HCV infection - risk factors

Introduction

Waste collection is a necessary activity all around the world and the removal of municipal solid waste is a job associated with a variety of biological, chemical, mechanical, physical, and psychosocial hazards [1]. Biological hazards reported in a survey study carried out on rag pickers included bandages, disposable diapers, toilet paper, sanitary napkins, disposable needles or syringes, and condoms, found that about a quarter (27%) of the rag pickers reported having contact with hospital wastes such as needles, syringes, and gauze, among other wastes [2].

Sharps generated from in-home medical use such as in the treatment of diabetes and discarded sharps collected by public safety personnel can pose significant problems when disposed in municipal solid waste. Uncontained sharps can pose a health and safety problem to personnel employed in solid waste facilities, where personnel inspecting bags for banned wastes or removing recyclables from the waste stream can be inadvertently punctured. These personnel often have difficulty disposing of sharps because of the limited number of collection locations [3].

In developing countries like Egypt, healthcare waste has not received much attention and it is disposed of together with domestic waste [4,5]. Collins and Kennedy [6] and Ferreira [7] reported that wastes from small clinics, pharmacies, and laboratories, and even hospital wastes, may also be found mixed with residential trash and carrying microorganisms responsible for more serious diseases.

Poor handling and management of healthcare waste can cause serious disease to health-care personnel, to waste handlers, patients and to the community at large. The greatest risk posed by infectious waste is accidental needle stick injuries, which can cause hepatitis B and hepatitis C and HIV infection [8].

Egypt has possibly the highest HCV prevalence in the world; 10%-20% of the general populations are infected and HCV is the leading cause of Hepatocellular carcinoma and chronic liver disease in the country [9-13].

According to Egypt Demographic and Health Survey (EDHS) (2008), 15% of the EDHS respondents age 15-59 had antibodies to the HCV virus in their blood, indicating that they had been exposed to the virus at some point. Ten percent were found to have an active infection [14]. Continued transmission in Egypt has been associated with transfusion of unscreened blood, invasive medical procedures including surgical operations, hemodialysis and injections by informal health care providers [12].

During the handling of wastes, injuries occur when syringe-needles or other sharps have not been collected in rigid puncture proof containers. Inappropriate design and/or overflow of existing sharps container and moreover unprotected pits increase the risk of exposure of the health care workers, of waste handlers and of the community at large, to needle stick injuries [8].

To the best authors' knowledge no past studies have investigated the actual prevalence of HCV infection and its risk factors among MSW collectors in Egypt. The objective of this study is to assess the prevalence of HCV antibodies in a group of municipal solid waste collectors in Mansoura city and to identify the associated risk factors.

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Subjects and Methods

This is a descriptive cross-sectional study done on solid waste collectors working at the Western Municipality of Mansoura city, Egypt during the period from January 1, 2011 to August 31, 2011.

The total number of collectors was 198 and all were males. The inclusion criteria are permanent or temporary collectors employed for one year or more. A total of 160 collectors fulfilled the eligibility criteria and 120 of them participated in the study (response rate of 75%). MSW collectors collect wastes from all sources using mainly tractors and trucks.

Ethical Consideration

Approval of the Western Municipality and an informed verbal consent of study subjects for participation were obtained with assurance of confidentiality and anonymity of the data. Subjects participated voluntarily with a full right to withdraw from the study. There is no Research Ethics Committee at the moment.

The MSW collectors were interviewed and examined at three regional assembly offices according to their geographical distribution. Data collected included the socio-demographic and occupational profile of workers, the use of personal protective measures, and reasons for non-compliance.

A 4 cc blood sample was taken from each participant through veni puncture and collected in a dry plastic tube. The sample was allowed to clot naturally to separate the serum for analysis and was stored upright at room temperature until it was transported to the laboratory for analysis. In the laboratory, each sample was centrifuged and stored in the freezer at – 70°C until being processed. An ELISA test kit was used for the qualitative determination of antibodies to hepatitis C virus (HCV) in the human serum.

Data Analysis

Data were analyzed using the SPSS version 16. Qualitative variables were described as numbers and percentages. Chi square or Fisher's exact test was used for comparison between groups; as appropriate. Quantitative variables were described as mean (± SD) and median.

Binary stepwise logistic regression analysis was used for prediction of independent risk factors. Significant risk factors in the bivariate analysis were entered into the regression model. Odds ratios and their 95% confidence intervals were calculated. A p value ≤ 0.05 was considered statistically significant.

Results

Table 1 shows that the majority (78.3%) of MSW collectors were above the age of 40, most of them (89.2% & 95%) were illiterate/read and write and from rural areas, respectively. They had long median duration of employment (15 years) and they collect wastes from all sources. About half of collectors experienced needle stick injuries in the past year and only 10.8% of them reported the availability of workplace staff rest room with a suitable place to eat, drinking water and washing facilities.

The use of personal protective measures at work was very low among MSW collectors; 4.2%, 3.3%, and 0.8% of them used gloves, boots, and face mask; respectively. Unavailability of protective measures was the main reason for non-compliance among 90% of them.

Table 2 reveals that 43.3% of MSW collectors were anti-HCV

Characteristic	MSW collectors (120) N (%)
Age (years):	
< 40	26 (21.7)
≥ 40	94 (78.3)
Mean ± SD	47.4 ± 9.7
Education:	
Illiterate/ read & write	107 (89.2)
Primary and preparatory	13 (10.8)
Residence:	
Rural	114 (95.0)
Urban	6 (5.0)
Duration of employment (years):	
Median (Min – Max)	15 (1 – 36)
Sources of collected waste*:	
Residential	111 (92.5)
Commercial	109 (90.8)
Industrial	105 (87.5)
Institutional	105 (87.5)
Biomedical	105 (87.5)
Workplace sanitary facilities	13 (10.8)
Needle stick injury	61 (50.8)
Personal protective measures:	
Gloves	5 (4.2)
Boots	4 (3.3)
Face mask	1 (0.8)
Reasons for non-compliance!	
Unavailability	108 (90.0)
Not fitting	4 (3.3)
Do not care	5 (4.2)

*Categories are not mutually exclusive.
! More than one answer were given for non-compliance

Table 1: Socio-demographic and occupational profiles of the MSW collectors.

	Anti-HCV		Significance
	Positive N(%)	Negative N(%)	
Total	52(43.3)	68(56.7)	
Age:< 40 years	6 (11.5)	20 (29.4)	χ^2 = 5.55, p=0.018
≥ 40 years (r)	46(88.5)	48 (70.6)	OR= 0.3 (0.1 – 0.92)
Education:			
Illiterate/ read & write	49 (94.2)	58 (85.3)	χ^2 = 2.4, p=0.118
Primary and preparatory (r)	3 (5.8)	10 (14.7)	OR= 2.8 (0.7 – 13.8)
Duration of employment:			
< 15 years	14 (27.0)	39 (57.4)	χ^2 = 11.1, p=0.001
≥ 15 years (r)	38 (73.0)	29 (42.6)	OR= 0.3 (0.1 – 0.6)
Residence:			
Rural	50 (96.2)	64 (94.1)	Fisher's exact, p=0.47
Urban (r)	2 (3.8)	4 (5.9)	OR=1.6 (0.23 – 12.8)
Biomedical waste collection:			
Yes	42 (80.8)	63 (92.6)	χ^2 = 3.8, p=0.051
No (r)	10 (19.2)	5 (7.4)	OR=0.33 (0.09 – 1.2)
Gloves use on duty:			
Yes	1 (1.9)	4 (5.9)	-
No	0 (0.0)	64 (94.1)	
Boots use on duty:			
Yes	2 (3.8)	2 (2.9)	Fisher's exact, p=0.58
No (r)	50 (96.2)	66 (97.1)	OR=1.3 (0.1 – 13.7)
Face mask use on duty:			
Yes	0 (0.0)	1 (1.5)	-
No	52 (100.0)	67 (98.5)	
Needle stick injury in the past 12 months: Yes	29 (55.8)	32 (47.1)	χ^2 = 0.89, p=0.344
No (r)	23 (44.2)	36 (52.9)	OR=1.4 (0.6 – 3.13)
History of blood transfusion:			
Yes	3 (5.8)	6 (8.8)	Fisher's exact,
No (r)	49 (94.2)	62 (91.2)	p=0.39OR=0.6 (0.12 – 3.1)
Workplace sanitary facilities:			
Yes	6 (11.5)	7 (10.3)	χ^2 = 0.05, p=0.83
No (r)	46 (88.5)	61 (89.7)	OR=1.14 (0.31 – 4.1)

Table 2: Prevalence and risk factors of Anti-HCV among MSW collectors.

Independent predictor	ß	p	OR (95% CI)
Duration of employment			
< 15 years ≥ 15 years (r)	-1.3 -	p=0.001	0.3 (0.1 – 0.6) 1
Constant Model χ^2 % correctly predicted	0.3 11.3, p=0.001 64.2%		

r = reference group, OR=Odds ratio, CI=Confidence Interval

Table 3: Logistic regression analysis of independent risk factors of Anti-HCV seropositivity among MSW collectors.

seropositive. Most of anti-HCV seropositive collectors were ≥ 40 years, illiterate, from rural areas, collect biomedical waste, and were employed for ≥ 15 years. Only one seropositive collector used gloves, two used boots, and none of them used facemask on duty. More than half of seropositive collectors (55.8%) reported that they experienced needle stick injuries in the past 12 months, about 6% of them had history of previous blood transfusion, and only 11.5% of them mentioned the availability of workplace sanitary facilities in the form of workplace staff rest room with a suitable place to eat, drinking water and washing facilities. None of the collectors had received parenteral anti-schistosomal therapy.

The age of MSW collectors and the duration of employment were the only statistically significant risk factors for anti-HCV positivity.

Logistic regression analysis in Table 3 showed that the shorter duration of employment of waste collector was independently associated with the less likelihood of anti-HCV seropositivity (OR = 0.3), after adjustment for age.

Discussion

The occupational risk for acquiring HBV infection in municipal solid waste workers (MSWWs) is not well established. HBV is resistant on exposed surfaces for more than 7 days and thus MSWWs are at risk of infection from contaminated sharp instruments (e.g. biomedical waste from private practitioners office or from intravenous drug users), which are improperly discarded. Some European countries (Italy, Greece) have recommended the immunization of these workers against HBV infection [15].

The results of our study revealed that, MSW collectors had a high prevalence (43.3%) of HCV antibodies. According to EDHS (2008), 15% of the respondents age 15-59 had antibodies to the HCV virus in their blood and ten percent were found to have an active infection. Men were more likely to be infected than women and the levels of infection increased sharply with age among both women and men. The much higher levels of infection among the older cohorts may be partially explained by their exposure to the schistosomiasis treatment programs during the 1960s-1980s which, are believed to have been a major transmission route [14].

In a village in Upper Egypt, the anti-HCV prevalence in the community was 8.7% and was significantly higher among male than female subjects. Prevalence increased with age, and there was a sharp increase after 30 years of age. Other relatively common exposures included hospital admission, sutures, surgery, intravenous catheterization, and dental treatment. The strongest of these associations was for history of parenteral therapy for schistosomiasis (odds ratio, 5.5). In the first decade of life, anti-HCV was more common in those who had received a blood transfusion than in those who had not: (25%) and (1.4%), respectively. All anti-HCV positive cases among those transfused were patients between 7 and 10 years of age, and 2 reported having undergone surgical procedures. Dental treatment and extraction were associated with anti-HCV status among those 30 and younger [16].

In Santos, southeastern Brazil, Rozman et al. [17] found that these seroprevalence of HCV infection among recyclable waste collectors was 12.4%. Study subjects were characterized by predominance of males with low educational and economic levels, subjected to parenteral and sexual exposures to HIV and other sexually transmitted infections, and ten percent of them reported intravenous drug use. It was concluded that this rate is approximately 10 to 12 times higher than the national average [18-20].

In Messina, Italy, Squeri et al. [21] found 3 MSW workers out of 327 (0.92%) with only antibodies to HCV.

In Keratsini (Greece), Dounias et al. [15] reported that, the prevalence of HBs Ag was higher in MSW collectors (11.3%) than in non-exposed group (4.5%), with no significant difference between them. It was also found that, in the age group <42 years, the prevalence of HBs Ag was 3.3% versus 10.2% in the age group ≥42 years with non-statistically significant difference. The prevalence of HBs Ag did not differ significantly between municipal employees with ≤10 years employment (7.4%) and those with >10 years (8.1%).

A recent study by Rachiotis et al. [22] of MSW workers in a municipality of central Greece reported that, the prevalence of HBV infection was 23%. Logistic regression analysis showed that exposure to waste (OR = 4.05; 95%CI = 1.23–13.33) and age (OR = 5.22; 95% CI = 1.35–20.1) were independently associated with the anti-HBc positivity. Moreover, waste collectors who reported occupational injuries with needle sticks were at higher risk of HBV infection (RR = 2.64; 95% CI = 1.01–6.96). The independent predictors reported by that study are similar to results of our study.

The higher prevalence of anti-HCV antibodies among MSW collectors could be explained by the fact that refuse collection is a hazard laden job which involves occupational exposure to high levels of needle stick injuries and injuries with contaminated sharp instruments which are improperly discarded from different hospitals and houses. MSW collectors collect and pack these wastes with their bare hands most times without gloves. The discarded contaminated syringes might be carrying blood possibly contaminated with a number of viruses including HCV which may increase the risk of infection among MSW collectors. The possibility of needle stick injuries increases with the longer duration of employment as waste collector and this is associated with increased risk of HCV infection.

There are numerous safety measures that could be implemented to reduce the risk of exposure to HCV infection and other blood borne pathogens:

*At medical facilities, implementation of source segregation and separate collection of hazardous wastes.

*Provision of protective clothing and shoes that should be cut resistant; fit for purpose; provided free by employers and worn by employees and agency staff where risks cannot be controlled by other methods.

*Provide solid waste workers with clean drinking water and sanitation facilities and a place to wash with soap before eating, smoking, or going home at the end of the workday.

*Periodic worker health surveillance, including baseline and follow-

up medical examinations, may be performed to prevent work-related disease; and to promote worker's ability to perform work satisfactorily without endangering the health and safety of self and/or others.

*Education about the health hazards to change the working behavior of this vulnerable group. Provide training on the value of good hygiene in disease prevention, including clean bandaging over any skin discontinuities during work and changing work clothing before leaving the site and taking public transport.

Conclusion

MSW collectors are at a higher risk of HCV infection than the general population due to their exposure to sharp injuries without any protective measures.

The MSW collectors' community is socially marginalized and generally not recognized by national programs as potentially endangered populations. Further research in the interventions that could reduce the high prevalence of Anti-HCV among collectors is required.

Study Limitation

An important limitation of our study is the absence of a control group.

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