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Research Article

Anti-*Toxoplasma*, Anti-rubella, and Anti-cytomegalovirus Antibodies in Dumpsite Workers of Erbil Governorate

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ABSTRACT

The present study aimed to detect the presence of anti-*Toxoplasma*, anti-rubella, and anti-cytomegalovirus (CMV) antibodies in the sera of dumpsite workers of Erbil Governorate. Eighty nine male dumpsite (Kany Qrzhala, Erbil Governorate) workers were included in this study. Serum was obtained for the detection of anti-*Toxoplasma*, anti-rubella, and anti-CMV antibodies using an automated cobas e411 immunoassay analyzer. No anti-*Toxoplasma* IgM antibodies were detected in any of the workers' sera, while (25.84%) showed a positive result for anti-*Toxoplasma* IgG antibodies. All workers' sera had no anti-rubella IgM and IgG2 antibodies, while (62.92%) of them revealed the presence of IgG1 in their sera. Anti-CMV IgM was found in (2.25%) of the sera, while (13.50%) of the sera revealed the presence of anti-CMV IgG antibodies.

Keywords: Cytomegalovirus, dumpsite workers, municipal solid waste, rubella, solid waste disposal, *Toxoplasma gondii*

INTRODUCTION

Workers handling wastes are at high risk to be exposed to hazardous biological and chemical factors including different vapors, smoke, fumes, and dust in addition to being exposed to chemical substances and infectious pathogens, including viruses, bacteria, fungi, and even parasites. According to some studies on workers in this sector, they have been found to experience more work-related symptoms and illnesses than other occupational groups.[1,2]

Waste materials provide a favorable environment in which microorganisms can thrive because of the presence of nutrients and moisture. Pathogenic microorganisms are well known to be present in medical and clinical waste or the waste derived from animal and human origins, posing a risk of infection to those handling these materials.[3] Irritation of the mucous membrane due to exposure to toxic materials or allergenic effects experienced after inhalation of a large number of microorganisms and their fragments is usually the greatest work-related hazard.[4]

Waste may include medical and clinical laboratory waste that may include extremely infectious agents, including a wide range of viruses. Parasitic diseases can also be acquired by these workers through vectors such as insects or domestic or wild animals such as rodents or cats and dogs that are harboring disease-causing microorganisms or acting as mechanical vectors. These kinds of vector-borne diseases include toxoplasmosis.[5]

Toxoplasmosis is caused by the intracellular parasite *Toxoplasma gondii* that infects up to a third of the world's population. Infection is mainly acquired by ingestion of food or water that is contaminated with oocysts shed by cats or by consuming contaminated meat containing tissue cysts. In addition, the infection may be acquired by coming in contact with cat feces containing oocysts.[6,7] Primary infection is usually subclinical, but in some patients, cervical lymphadenopathy or ocular disease can be present. In immunocompromised patients, reactivation of latent disease can cause life-threatening encephalitis.[8]

Rubella (German measles) is caused by an RNA virus of the togavirus group. It is a contagious disease. Most people who get rubella usually have a mild illness, with symptoms that can include a low-grade fever, sore throat, and a rash that starts on the face and spreads to the rest of the body, in addition to the drastic effect of the virus on the fetus in pregnant women.[9]

Cytomegalovirus (CMV) is an infection caused by a DNA virus of the herpes group. The common modes of infections

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are through saliva, urine, stool, breast milk, and unscreened blood transfusion.[10]

The diagnosis of acute *Toxoplasma*, rubella, and CMV infection can be established by the demonstration of seroconversion in paired sera or by the demonstration of specific IgM antibodies.[11]

This study was conducted to detect the presence of anti-*Toxoplasma*, anti-rubella, and anti-CMV antibodies in the sera of dumpsite workers of Erbil Governorate. This may reflect the health status of those workers and their exposure to infectious agents.

MATERIALS AND METHODS

Subject Selection

Eighty-nine male dumpsite (Kany Qrzhala, Erbil Governorate) workers were included in this study.

A questionnaire sheet [Figure 1] was filled out for each worker included in the study.

Sample Collection

Five milliliter of venous blood was collected by disinfecting the antecubital fossa with 70% ethanol and using a disposable syringe

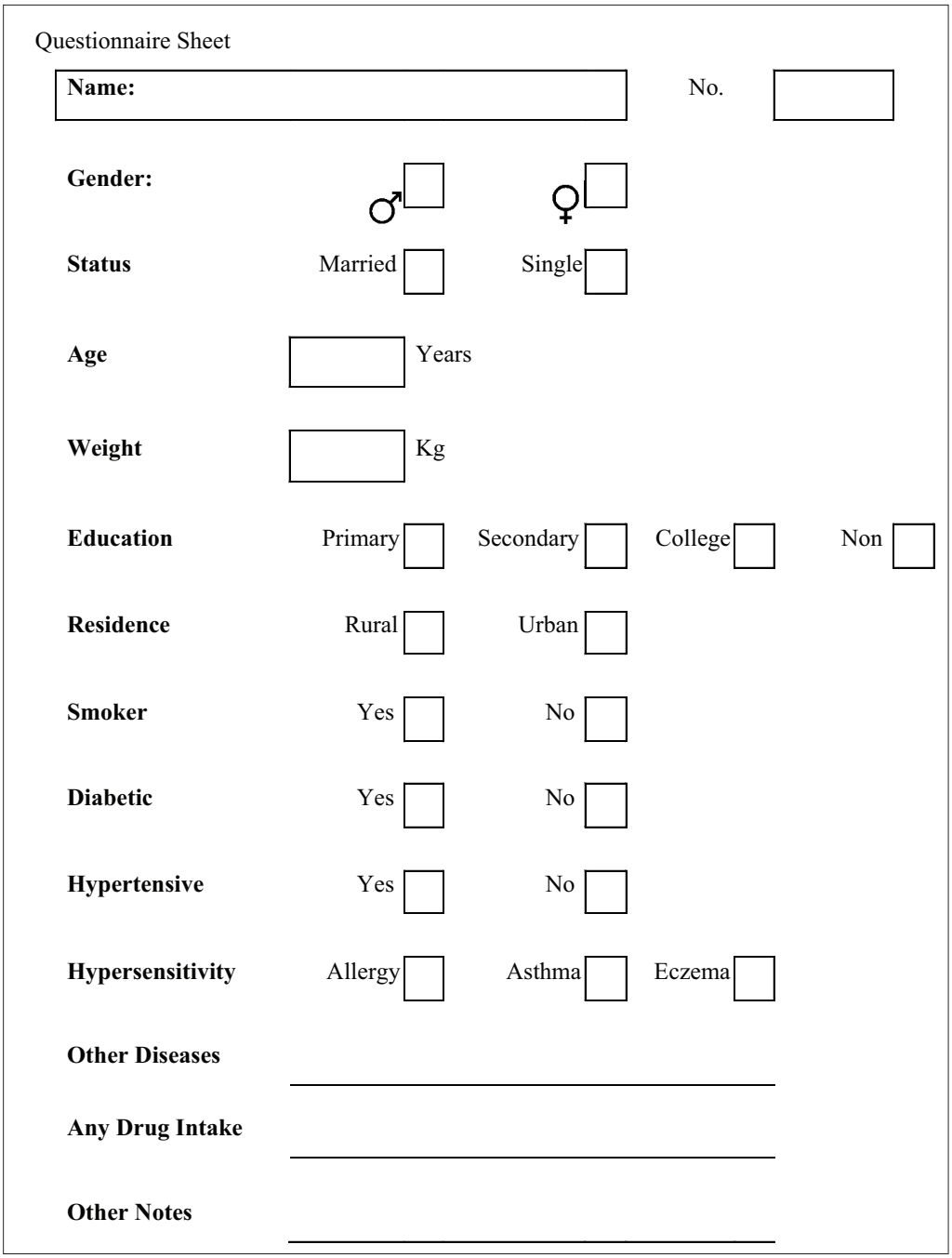

Figure 1: Questionnaire sheet for each worker included in a study concerning the detection of different antibodies in the sera of Kany Qrzhala dumpsite workers, Erbil Governorate

with a 23-gauge needle after applying a tourniquet. The blood was placed in a plain tube and left to the stand for 1 h at room temperature for clot formation. The tube was centrifuged for 10 min at 4°C at 450×g for serum collection. The serum was then aspirated by using a Pasteur pipette and was dispensed into sterile glass tubes (0.5 ml in each) and was stored at −20°C until used.

Detection of Anti-*Toxoplasma*, Anti-rubella, and Anti-CMV Antibodies

The stored sera were used for the detection of anti-*Toxoplasma* IgG and IgM antibodies; anti-rubella IgG1, IgG2, and IgM antibodies; and anti-CMV IgG and IgM antibodies, using automated cobas e411 immunoassay analyzer, following the instructions provided with the kits. All sera and test reagents were brought to room temperature.

RESULTS

Workers' Information

This study involved 89 men with ages ranging from 12 years to 65 years. 92.13% of the workers lived in rural areas, while 7.87% lived in urban areas. 58.43% were smokers and 41.57% were nonsmokers. 38.20% were single, while 61.80% were married. 37.08% were illiterate, 40.45% had primary school education, 17.97% had secondary school education, 2.25% had a diploma, and 2.25% had a B.Sc. degree [Table 1].

Table 1: Demographic description of Kany Qrzhala dumpsite workers, Erbil Governorate

Parameter	*n* (%)
Live in rural areas	82 (92.13)
Live in urban areas	7 (7.87)
Smoker	52 (58.43)
Non-smoker	37 (41.57)
Single	34 (38.20)
Married	55 (61.80)
Illiterate	33 (37.08)
Primary school education	36 (40.45)
Secondary school education	16 (17.97)
Diploma degree	2 (2.25)
B.Sc. degree	2 (2.25)

Frequency of Anti-*Toxoplasma* Antibodies

None of the workers' sera revealed the presence of anti-*Toxoplasma* IgM antibodies, while 25.84% were found to be positive for anti-*Toxoplasma* IgG antibodies [Table 2].

Frequency of Anti-rubella Antibodies

None of the workers' sera revealed the presence of anti-rubella IgM and IgG2 antibodies, while 62.92% were found to be positive for anti-rubella IgG1 antibodies [Table 3].

Frequency of Anti-CMV Antibodies

IgM antibodies against CMV were detected in two workers (2.25%). 13.5% of the workers revealed the presence of anti-CMV antibodies in their sera [Table 4].

A summary of the results is summarized the Figure 2.

DISCUSSION

About 40% of the world's waste ends up in large rubbish dumps that are usually located close to urban populations in underdeveloped and developing countries. This poses a serious threat to the environment, in addition to human health.[12]

Increase of solid waste is mainly due to urbanization and population growth and that in turn creates problems for municipal corporation to properly manage that kind and amount of waste. It has been shown that excreta and other liquid and solid waste from household and the community represent a health hazard and are the causes of many serious infection spread.[13]

Improper handling of wastes represents a serious risk to human health, especially those working in the dumpsites;

Table 2: Anti-*Toxoplasma* IgM and IgG antibodies in the sera of Kany Qrzhala dumpsite workers, Erbil Governorate

Parameter	Ig	Number of workers	Number of positive cases	%	Number of negative cases	%
Toxoplasma	IgM	89	0	0	89	100
	IgG	89	23	25.84	66	74.16

Table 3: Anti-Rubella IgM, IgG1 and IgG2 antibodies in the sera of Kany Qrzhala dumpsite workers, Erbil Governorate

Parameter	Ig	Number of workers	Number of positive cases	%	Number of negative cases	%
Rubella	IgM	89	0	0	89	100
	IgG1	89	56	62.92	33	37.08
	IgG2	89	0	0	89	100

Table 4: Anti-cytomegalovirus IgM and IgG antibodies in the sera of Kany Qrzhala dumpsite workers, Erbil Governorate

Parameter	Ig	Number of workers	Number of positive cases	%	Number of negative cases	%
Cytomegalovirus	IgM	89	2	2.25	87	97.75
	IgG	89	12	13.50	77	86.50

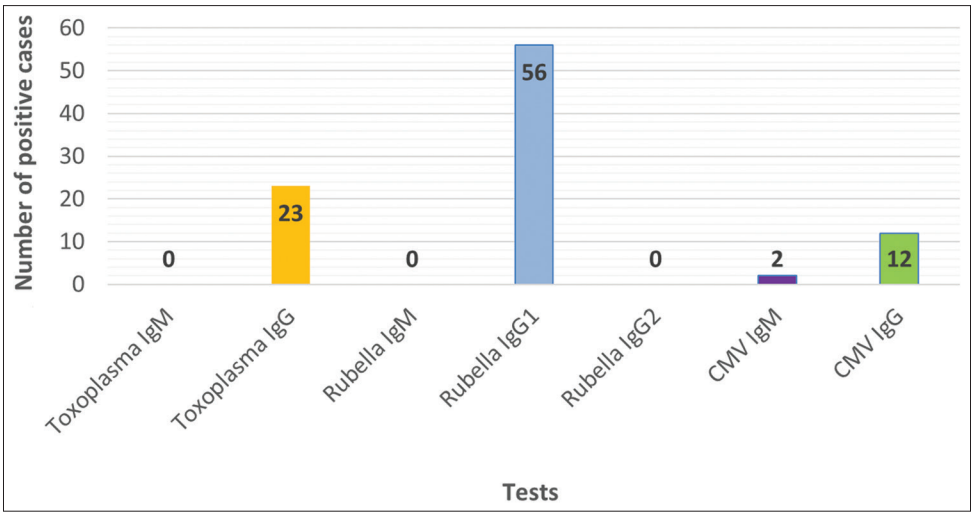

Figure 2: Anti-*Toxoplasma*, anti-rubella, and anti-cytomegalovirus antibodies in the sera of Kany Qrzhala dumpsite workers of Erbil Governorate

protection of these people from these health threats should be a major concern. These wastes may also include hospitals and clinics wastes that pose a major health issue, in addition to municipal wastes. Moreover, it is well known that insect and rodent vectors are attracted to waste sites and can spread diseases such as cholera and dengue fever. Public Health Service in the U.S.A. identified 22 human diseases that are linked to improper management of solid wastes. Waste worker and pickers in developing countries are seldom protected from direct contact and injury.[14-16]

Despite the fact that the results of the current study showed low number of individuals profiling antibodies against the three microorganisms included; however, their presence does implicate that such workers are at risk of acquiring serious infections. Dumpsite workers are continuously exposed to dust that contains many harmful substances including bioaerosols, which are airborne materials and are associated with microorganisms. This will impose a biological hazard due to direct contact, inhalation, or ingestion of these particles by the workers, leading to diseases.[17]

T. gondii is an obligate intracellular protozoan parasite that is capable of infecting a variety of intermediate hosts including humans. Infected definitive hosts (cats) shed oocysts in feces that rapidly mature in the soil and become infectious. Toxoplasmosis is acquired by humans through ingestion of food or water contaminated with cat feces or through eating undercooked meat containing viable oocysts. Vertical transmission of the parasite through the placenta can also occur, leading to congenital toxoplasmosis. Following the primary infection, *T. gondii* can remain latent for the life of the host; the risk for reactivation is highest among immunosuppressed individuals.[18]

A positive *Toxoplasma* IgG result is indicative of the late current or past infection with *T. gondii*. A single positive *Toxoplasma* IgG result should not be used to diagnose recent infection. Individuals with negative *Toxoplasma* IgG results are presumed to not have had previous exposure to *T. gondii*. However, the negative results may be seen in cases of remote exposure with subsequent loss of detectable antibody. Seroconversion from negative to positive IgG is indicative of *T. gondii* infection subsequent to the first negative specimen.[19] 25.84% of the individuals included in this current study showed a positive result for anti-*Toxoplasma* IgG antibodies. This may indicate a previous exposure to the parasite, which could have been acquired during their work in the dumpsite.

Rubella (German or 3-day measles) is a member of the togavirus family, and humans remain the only natural host for this virus. Transmission is through inhalation of infectious aerosolized respiratory droplets.[20] The presence of IgG antibodies is an indicator of previous infection, which is the case in the workers included in the current study.

A negative CMV IgM result suggests that the patient is not experiencing acute or active infection. However, a negative result does not rule out primary CMV infection. Positive CMV IgM results indicate a recent infection (primary, reactivation, or reinfection). IgM antibody responses in secondary (reactivation) CMV infections have been demonstrated in some CMV mononucleosis patients, in a few pregnant women, and in renal and cardiac transplant patients. Positive CMV IgG results indicate the past or recent CMV infection. These individuals may transmit CMV to susceptible individuals through blood and tissue products.[21] 2.25% of the workers demonstrated a possible active infection, while 13.50% demonstrated a possible previous infection. Those with active infections pose a hazard on the community and could pass on the infection to susceptible individuals.

Periodic surveys and treatment of these workers are essential to keep them healthy and prevent spread of diseases through them. Workers should also be trained on the safe and proper techniques of dealing with wastes and how to protect themselves from injury and infection. In addition, protective clothing is advised to be provided to these workers to prevent any harm caused by handling waste.

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