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Seroprevalence of Cytomegaloviruses in Afghanistan

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ABSTRACT

Objective: Human Cytomegalovirus (CMV) is a member of the Herpesviridae family, with the ability to establish a long-lived latent infection. CMV infection causes problems in immunocompromised hosts undergoing organ and stem cell transplantation. The prevalence of CMV in adults varies in different geographic regions. The purpose of this study was to assess the prevalence of CMV in the adult population of Afghanistan, which did not have epidemiologic information for CMV infection.

Methods: A total of 500 adults residing in main regional provinces of Afghanistan including Nangarhar, Herat, Mazar-i Sharif, Kandahar and Kabul in the age range of 25-70 years old were randomly selected to include in the study. Among the participants, 263 (52.6%) were female and 237 (47.4%) were male. The samples were tested for the presence of CMV IgM and IgG antibodies using chemiluminescence immunoassay on the Abbott Architect automated platform.

Results: The seropositivity of CMV was found 99.79 % in Afghanistan. There were no significant differences in the prevalence CMV infection among the five regions. The seropositivity anti-CMV IgG positive rate in Kandahar, Kabul, Nangarhar and, Herat was determined as 100%. The CMV IgG prevalence was 98.99% in Mazar-i Sharif. Anti CMV IgM was found 1.24% in Afghanistan.

Conclusions: Our study shown that the seroprevalence is high in Afghanistan. Because of the high frequency of seropositivity in general population in Afghanistan, the approaches for preventing CMV reactivation need to be developed. *J Microbiol Infect Dis 2019; 9(2): 78-82.*

Keywords: *Seroprevalence, CMV, adult, population, Afghanistan*

INTRODUCTION

It was informed that about 3 in 10 deaths in Afghanistan are due to communicable diseases and infections [1]. Environmental health, vaccination, and health workers trained in early diagnosis and treatment are important factors in controlling communicable diseases [1]. Screening for communicable diseases and infections is also essential for the control of them and serves to the determination of appropriate protective measures.

Human Cytomegalovirus (CMV), a member of Herpesviridae family, is prevalent in the human population worldwide [2]. Almost all people are sometimes infected with CMV during their life. [3]. Like other herpes viruses, following a primary infection, lifelong latency preceded by episodes of recurrent infection is experience [6]. CMV infection may be acquired congenital, perinatally or postnatally [4]. CMV can be transmitted by means of congenital, oral, sexual contact, blood transfusion, and tissue transplantation [5]. CMV can cause mild or asymptomatic diseases in children and adults. However, it is important as an opportunistic pathogen in immunocompromised hosts, most notably transplant recipients and HIV-infected persons [7-8]. In addition, in newborns, some abnormalities may be caused by congenital or perinatal CMV infection. CMV is the most prevalent congenital infection in humans, which occurs in about 1% of all live births.

Serological tests such as enzyme-linked immunosorbent assay (ELISA) are useful for defining CMV infection in the past or acute/ recent infection, determined by the presence of

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CMV IgG and IgM antibodies respectively [3]. The best method to evaluate the seroprevalence of CMV infection is the study of CMV-specific IgG antibodies [9].

Seroprevalance of CMV infection is related to different epidemiological factors such as cultural and socioeconomic status of population. Although CMV has a worldwide distribution, CMV infection is more common in developing countries [8]. Populations of lower socioeconomic status have higher seroprevalance of CMV [3,10].

The detection of seroprevalence of CMV infection in the population can be effective in order to implement measures that might prevent CMV infection. Especially, determination of seronegative mothers is important to prevent congenital CMV infection.

In Afghanistan only limited studies exist on epidemiology of CMV infection. Thus, the aim of this study is to determine the seroprevalence of CMV infection in an adult population in different regions of Afghanistan.

METHODS

Study patients

The Afghanistan National Public Health Institute, in collaboration with the World Health Organization, randomly collected 5898 samples among adults between 25-70 years of age from Nangarhar (eastern zone), Herat (western zone), Mazar-i-Sharif (northern zone), Kandahar (southern zone) and Kabul (central zone) (Roughly equal numbers are sampled in each region) to investigate the prevalence of risk factors for non-communicable diseases in the main regional provinces of Afghanistan using the WHO STEP wise Approach. This opportunity has enabled us to design CMV screening studies in the Institute of Hepatology, Ankara University. Due to limitations in the transfer of samples abroad and limited resources, only 500 samples were randomly selected (almost equal number of samples from each city) for CMV screening.

The selected population was adults with age mean 39 ± 12 (25-70) years old. Among the participants, 263 (52.6%) were females and 237 (47.4%) were males. All participants gave consent to be incorporated in the study. Temporary residents (<6 months) living in migrant camps or insecure areas were excluded.

This study was approved by the institutional review board of the public health ministry of Afghanistan.

Based on the designed protocol, all the participants were given consent forms by the local authorities who were collecting samples.

Serological Testing for CMV IgM and CMV IgG

Serum levels of IgM and IgG antibodies against CMV were detected by using commercially available chemiluminescent microparticle immunoassay (CMIA) according to the manifacturer's instructions. (Architect i2000SR; Architect CMV IgM assay and Architect CMV IgG assay, Abbott, Germany).

Due to the low volume and unusable quality of some samples, only 482 and 485 samples were tested for CMV, using Abbott architect CMV IgM assay and architect CMV IgG assay, respectively.

Samples with concentrations ≥1.0 index and ≥6.0 AU/ml are considered reactive in the Architect CMV IgM assay and Architect CMV IgG assay, respectively.

RESULTS

Of the 485 samples tested, 484 samples were reactive in the Architect CMV IgG. In this study, the rates of CMV seropositivity were found 99.79% in Afghanistan. The prevalence of anti-CMV IgG positive rate in Kandahar, Kabul, Nangarhar and, Herat was determined as 100%. Mazar-i Sharif showed the lowest prevalence (98.99%) among the other regions (Figure 1).

Of the 482 samples tested, 6 samples were reactive in the ARCHITECT CMV IgM assay. While anti-CMV IgG was found very high in all the regions of Afghanistan, anti CMV IgM was found 1.24%. In this study, any anti-CMV IgM positive samples was determined among the populations of Kandahar, Kabul and, Mazar-i Sharif. The seropositivity of anti-CMV IgM was 4.65% and 2.04% in Nangarhar and Herat, respectively. In all anti-CMV IgM positive samples, anti-CMV IgG was found to be positive. The positivity of anti-CMV IgM, and

anti-CMV IgG in an adult population in different regions of Afghanistan was shown in Table 1.

Figure 1.

Table 1. The positivity of Anti-CMV IgM and Anti-CMV IgG in different regions of Afghanistan.

Regions	**Anti-CMV IgM Positive samples/total samples (n)**	**Positive samples (%)**	**Anti-CMV IgG Positive samples/total samples (n)**	**Positive samples (%)**
Kandahar	0/100	0	100 /100	100
Kabul	0/99	0	99/99	100
Mazar-i Sharif	0/99	0	98/99	98.99
Nangarhar	4/86	4.65	88/88	100
Herat	2/98	2.04	99/99	100
Total	6/482	1.24	484/485	99.79

DISCUSSION

The seropositivity of CMV varies among people from distinct regions and socioeconomic groups. The prevalence of antibody and the socioeconomic status of the population are correlated. The prevalence of antibody is significantly high in developing regions such as Africa and Southeast Asian countries, whereas it is low in North America, Australia and Europe [3].

We investigated the prevalence of CMV among adult population in Afghanistan. The serological screening results showed high prevalence of CMV infection in Afghanistan. In this study, there were no differences among the five zones (Eastern, eastern, northern, southern and, central) of Afghanistan in terms of seropositivity of CMV.

In our study, of the samples obtained from 482 adults, 6 samples (1.24%) were found to be anti-CMV IgM positive. Anti-CMV IgG was found

positive in all the samples with anti-CMV IgM positive. Anti-CMV IgM detection is a sensitive indicator of primary infection. However its specificity is inadequate because CMV IgM may be produced during viral reactivation and sustain following primary infection in some patients [10]. Thus, CMV IgG avidity test which facilitate the distinction between primary and non-primary CMV infection is extremely required. It would be possible to think that one of the factors limiting our study is that CMV IgG avidity test were not examined for anti-CMV IgM positive samples.

We found that CMV seropositivity was 99.79% in adults of Afghanistan. Frui et al informed that 76.6% of Japanese blood donors were CMV seropositive [7]. They also reported that the seroprevalences among donors at age 20 and 30 were 58.3% and 73.3%, respectively. Bate et al. determined that age-adjusted CMV infection seroprevalence was 50.4% in individuals aged 6-49 years in the United States [9].

Voigt et al determined that the seroprevalence of CMV was 27.4% in population of children and adolescents in Germany. They also reported that CMV seropositivity was significantly associated with low socioeconomic status and migration background (such as country of origin and place of birth) [13]. The rate of CMV seroprevalence among pregnant woman in Turkey was reported in the range of 92.6%-98.7% [14].

A study demonstrates 98.5% of blood donors in Iran were positive for anti-CMV IgG and suggested that blood transfusion is an important spreading route of CMV infection in this country [15].

Erfanianahmadpoor et al. evaluated that the seroprevalence of CMV-IgG and CMV-IgM in pregnant women with age mean 26.8±5.6 years and their infants in Mashhad, Iran [11]. They found anti-CMV IgG positivity in all mothers and their neonates, only 6 were positive for anti-CMV IgM (2.6%), and their infants were negative.

Jahan et al. investigated the seroprevalence and seroconversion of CMV in pregnancy. They found CMV IgG positivity in all 300 (100%) pregnant women and subsequently anti CMV IgM positive were found in 180 (60%) individuals throughout distinct trimester of pregnancy. They suggested that CMV IgG seroprevalence and CMV reactivation rates were high in Bangladeshi pregnant women. [3]. The seroprevalence of CMV was found 96.1% in pregnant Nigerian women by Anuma et al [12]. In Libya, Abusetta et al. informed that the prevalence of anti-CMV IgG in pregnants was 75.1%; meanwhile the overall prevalence of anti-CMV IgM was 24.6% in same group [6].

As shown that the CMV seroprevalence varies by region. We thought that these different results may be due to different socioeconomic status of the countries. It is known that CMV infection is more common in underdeveloped countries and among lower socioeconomic groups in developed countries [3].

The low number of samples and non-re-testing are the main constraints of this study that are important to note, but the results are significant because of the lack of previous studies.

In conclusion, the seroprevalence of CMV among an adult Afghanistan population was 99.79%. In other words, CMV IgG seroprevalence is high among adult population in Afghanistan. According to the results of the our study, high seropositivity rates for CMV in Afghanistan indicate that most of the people were exposed to CMV by the time they reach adulthood. We suggested that higher seroprevalence of CMV lead to an increased chance of reactivation and reinfection of people such as pregnant women and transplant recipients. Because of the high frequency of seropositivity in general population in Afghanistan, it is almost impossible to find a seronegative person. Therefore, it is need to develop and implement strategies for prevention of CMV reactivation, especially in immunocompromised patients receiving seropositive blood.

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