

Congenital cytomegalovirus: Awareness among a medical student cohort.

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Abstract

Introduction: Cytomegalovirus (CMV) is a human virus that is widely prevalent globally and is a leading cause of congenital infections. Congenital CMV infection can cause a host of neurodevelopmental delays and other effects, including sensorineural hearing loss, of which is it the main non-genetic cause of childhood deafness. Despite this, public knowledge of the virus is low, and it has been demonstrated that many physicians are not aware of the impact of congenital CMV infection, and even fewer counsel patients on prevention. The objective of the present study is to assess knowledge of Memorial University medical students of congenital CMV infection, and attitudes towards patient counselling and prevention strategies.

Methods: A short questionnaire was distributed to undergraduate medical students at Memorial University, as well as undergraduate science students. The questions assessed knowledge with regards to transmission, sequelae, treatment, and prevention of the infection, as well as student's knowledge of current prevention and patient counselling guidelines for physicians.

Results: When questioned on prevalence, the majority of students reported they did not know, 36.1% of medical and 0% of undergraduate students correctly identified CMV as the most prevalent congenital condition worldwide. The majority of students reported that they did not know the method of transmission of CMV, which is through bodily fluids such as blood and saliva. Overall, the majority medical students were unaware of the prevalence of congenital CMV, the transmission of the virus and the clinical outcomes of the disease.

Interpretation: This study demonstrated that there is an overall low level of knowledge regarding congenital CMV infection amongst students. CMV is a common congenital infection worldwide

and carries a significant global burden of disease. Therefore, the results of this small pilot study indicate that education on the topic should be increased in medical education. More research is needed to validate findings and further explore the knowledge of students and medical practitioners with respect to this very prevalent and relatively unknown condition.

Introduction

Cytomegalovirus (CMV) is a human virus that is widely prevalent globally and is a leading cause of congenital infections. Its seroprevalence is widely variable based on population, race, and socioeconomic status, with the highest rates being in developing countries. In these settings, prevalence rates may exceed 90%, with rates of approximately 40-70% in more developed countries¹. The virus is typically asymptomatic or mildly symptomatic but can have detrimental effects in immunocompromised hosts. Some of the most devastating consequences result from congenital infection. Congenital CMV infection can cause a host of neurodevelopmental delays and other effects, including sensorineural hearing loss. Other effects include microcephaly, neurodevelopmental delays, seizure disorders, cerebral palsy, vision impairments and even death². It is the most common congenital infection worldwide, affecting 0.6-0.7% of all live births. This equates to approximately 30,000-50,000 infants born with congenital CMV in the United States each year³. Despite its widespread prevalence and potentially harmful consequences, it is not a well-known virus in the public. The lack of available vaccine and limitations of treatment makes congenital CMV infection a neglected public health concern.

Despite being a major cause of birth defects worldwide, public awareness of congenital CMV infections remains low. In one study, only 7% of men and 13% of women in the United States were aware of CMV¹. These rates were much lower than those of conditions such as toxoplasmosis and fetal alcohol syndrome, despite their prevalence rates being lower than those of congenital CMV infection (Table 1). This is problematic as with a lack of available vaccine, hygienic practices such as frequent handwashing during pregnancy are currently the only way to prevent congenital CMV infection. Despite this, few physicians advise patients on how to avoid contracting the virus. One American study in 2008 showed that only 44% of obstetrician/gynaecologists counselled their pregnant patients on CMV and how to prevent infection⁴.

The objective of the present study is to assess knowledge of Memorial University medical students of congenital CMV infection, and attitudes towards patient counselling and prevention strategies. Given the low level of awareness amongst the public and of healthcare professionals, the goal is to identify any gaps that may exist in medical education regarding this underrecognized condition.

Methods

A short questionnaire was distributed to 320 undergraduate medical students at Memorial University via email. The questions assessed knowledge with regards to transmission, sequelae, treatment, and prevention of the infection, as well as student's knowledge of current prevention and patient counselling guidelines for physicians. The survey was also distributed to undergraduate science students of Memorial University and responses compared to medical

students to assess educational needs. Ethics approval was obtained by the Human Research Ethics Board. A copy of the distributed questionnaire is available in Appendix 1.

Results

The total sample size was 62 respondents. Of these, 36 were medical students, and 26 were undergraduate science students. The majority of the medical student respondents were in first and second year, and most undergraduate students were in the third or fourth year of their programs. Of the respondents, 90.3% had not received prior healthcare training such as nursing or pharmacy. Thus, the majority of the data reflect education received in the student's current program. Students were surveyed on their familiarity with congenital conditions. CMV had the least familiarity compared to other conditions. (Table 1).

CONGENITAL CONDITION	MEDICAL STUDENT FAMILIARITY	LIVE BIRTHS AFFECTED
Cytomegalovirus	53%	0.6-0.7% ³
Down syndrome	94%	0.17% ⁶
Toxoplasmosis	36%	0.01-0.1% ⁷
Congenital syphilis infection	64%	0.0003% ⁴
Congenital rubella syndrome	58%	~0% ⁸
Congenital varicella syndrome	61%	~0% ⁵

Table 1: Medical student awareness of congenital conditions (reported “somewhat familiar” or greater) in comparison with their approximate global disease burden.

When questioned on prevalence, the majority of students reported they did not know, 36.1% of medical and 0% of undergraduate students correctly identified CMV as the most prevalent congenital condition worldwide. (Figure 1). The majority of students reported that they did not know the method of transmission of CMV, which is through bodily fluids such as blood and saliva³. Blood transfusion and sexual transmission were correctly identified as methods of transmission by 52.8% and 41.7% of medical students, respectively. However, sharing food and

drink, sharing eating utensils, and contact with wet diapers were selected less often by students. Several medical students (11.1%) also incorrectly indicated contact with cat litter as a method of CMV transmission. (Figure 2). In addition, many medical students were unaware of the clinical manifestations of congenital CMV infection. Asymptomatic infection was correctly identified as an outcome by 30.6% of students, and hearing loss by 50%. Visual impairments and developmental delay were indicated as effects by 36.1%. Growth restriction, seizures, death and microcephaly are also possible manifestations of the disease that were selected by fewer students, (Figure 3). The majority of medical students were also not aware of how CMV infection can be prevented (61.1%). Hand hygiene and avoidance of saliva are the only current practices available to prevent infection³. These were identified by only 25% and 16.7% of students. The incorrect options of vaccine and drug treatments were each selected by 13.9% of students (Figure 4). When questioned about whether or not they thought congenital CMV should be a priority for physician counselling, 50% of medical students reported yes, and 50% reported they didn't know, while 76.9% of undergraduates reported yes and 19.1% didn't know. Only one response received reported they did not believe it should be a priority.

Figure 1: Prevalence of congenital conditions as reported by respondents

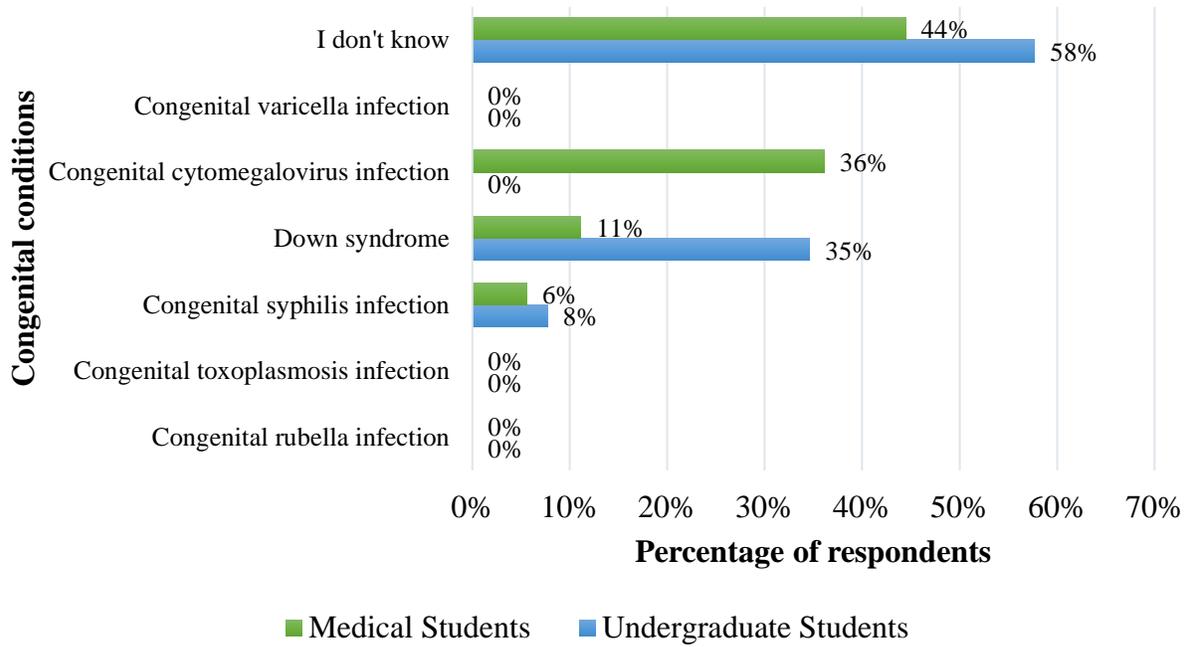


Figure 2: Methods of transmission of congenital CMV infection as perceived by respondents

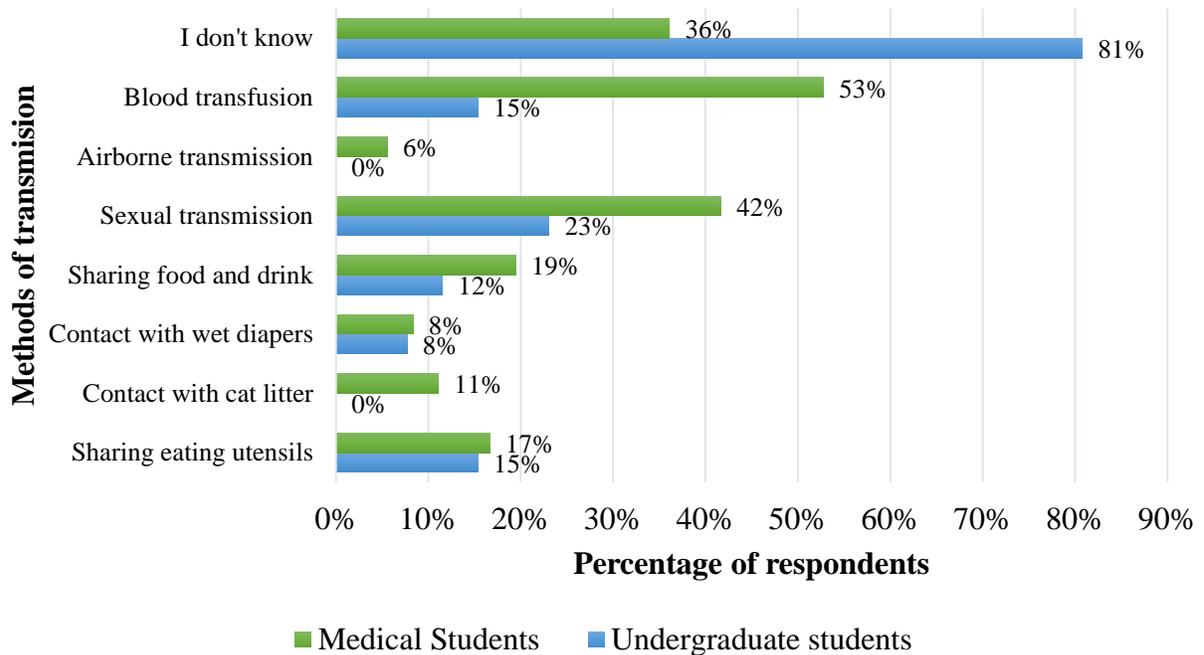


Figure 3: Clinical outcomes of congenital CMV infection as perceived by respondents

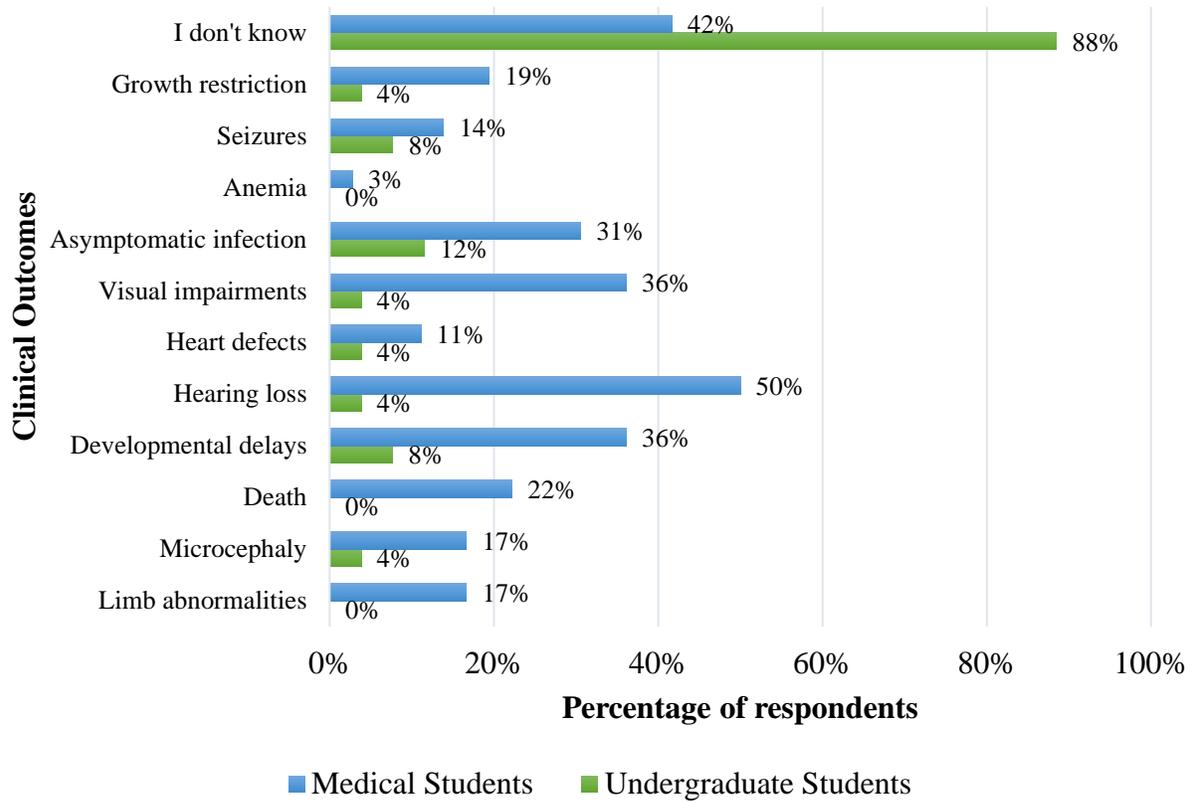
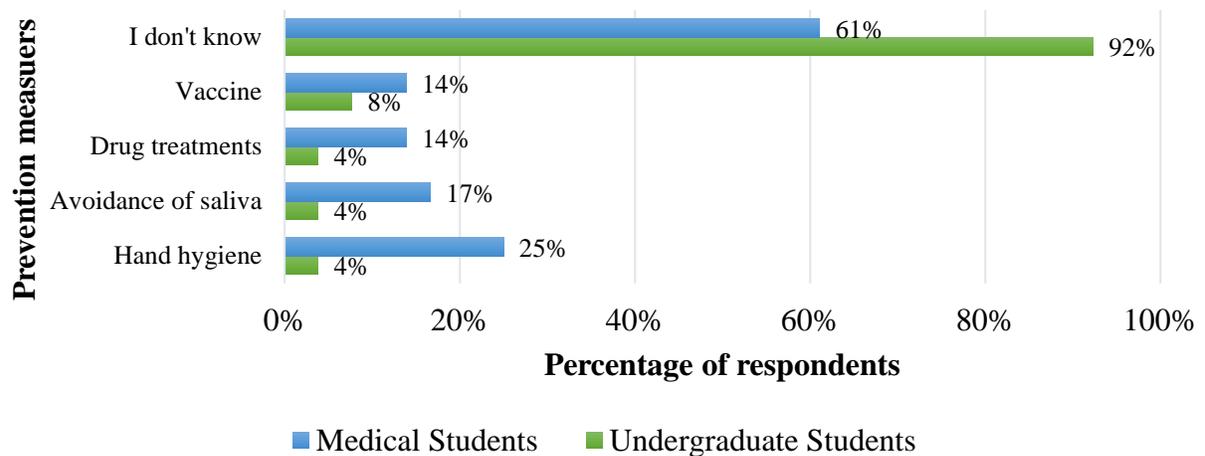


Figure 4: Methods of CMV prevention as perceived by respondents



Interpretation

This study demonstrated that there is an overall low level of knowledge regarding congenital CMV infection amongst students. Although medical students have an increase in knowledge compared to their undergraduate science counterparts, there still appears to be knowledge lacking in the area. Many students were not aware of the methods of transmission, clinical outcomes, and prevention measures of the infection.

CMV is the most common cause of congenital malformations in developed countries. The most frequent defect is sensorineural hearing loss, of which congenital CMV is the leading non-genetic cause worldwide. It is estimated that 21% of all hearing impairments at birth, and 25% of those at 4 years of age are a result of congenital CMV infection³. Other effects include microcephaly, neurodevelopmental delays, seizure disorders, cerebral palsy, vision impairments and even death, although the majority of infections are asymptomatic². In this study, only 36% of medical students could identify CMV as the most common congenital infection, despite it being a major cause of birth defects. 31% of medical students were able to identify asymptomatic infection as being a clinical outcome, with 50% identifying hearing loss.

CMV is transmissible by urine, saliva, breast milk, and genital secretions¹. Sexually active adolescents, breastfeeding infants, toddlers and care providers of young children are at highest risk for primary infection³. Among women of reproductive age, prolonged contact with urine and saliva of young children is the greatest risk factor for contracting the virus, and thus for congenital CMV infection. Students correctly identified blood transfusion and sexual transmission as routes of infection 53% and 47% of the time, respectively. Routes that involved contact with saliva and urine were correctly identified by less than 20% of respondents. This is problematic as with a lack of available vaccine, hygienic practices such as frequent handwashing

during pregnancy are currently the only way to prevent congenital CMV infection. Only 25% of medical students properly were able to correctly identify hand hygiene as the only correct measure of CMV prevention. Several medical students (11.1%) also incorrectly indicated contact with cat litter as a method of CMV transmission. This is likely due to confusion with toxoplasmosis, which can be transmitted through contact with cat feces, and is the basis of the commonly known counselling guideline for pregnant women to avoid contact with cat litter².

There are several limitations of the study, including small sample size. This study includes only a small convenience sample from one medical school, and may not be representative of other schools. Potential for biased responses represents another limitation. Survey respondents may have been more likely to choose to complete the survey if they had existing knowledge of congenital CMV infection, or an interest in the area. In addition, the majority of respondents were in first or second year of medical school. The population of respondents may not accurately represent the knowledge gained throughout the entirety of medical school. However, the low level of knowledge among population of even entering medical students, who represent an educated cohort, suggest that awareness of congenital CMV infection should be further addressed.

In future, more research is needed to validate findings and further explore the knowledge of students and medical practitioners with respect to this very prevalent and relatively unknown condition. It would be beneficial to assess the knowledge of CMV within a larger group of medical students, including all years of study and multiple universities, to gain a better understanding of their knowledge and educational gaps. This research can also be expanded to include medical residents and practicing physicians who care for pregnant women and children

affected by this condition. CMV is a common congenital infection worldwide and carries a significant global burden of disease. Therefore, the results of this small pilot study indicate that education on the topic should be further addressed in medical education.

Appendix 1: Sample Research Questionnaire

Awareness Among Memorial University Students of Congenital Cytomegalovirus (CMV) Infection

1. What education program are you currently enrolled in?
 - Undergraduate student
 - Medical student

2. What year of your program are you enrolled?
 - 1st
 - 2nd
 - 3rd
 - 4th

3. Did you receive any training or experience as a health care professional prior to your current program?
 - Yes
 - No

4. How familiar are you with the following congenital conditions (Choose from Very familiar, somewhat familiar, not very familiar, or have not heard of this condition)
 - Congenital rubella syndrome
 - Congenital toxoplasmosis infection
 - Congenital syphilis infection
 - Down syndrome
 - Congenital cytomegalovirus infection
 - Congenital varicella syndrome

5. Which of the following congenital conditions do you know to be most prevalent?
 - Congenital rubella syndrome
 - Congenital toxoplasmosis infection
 - Congenital syphilis infection
 - Down syndrome
 - Congenital cytomegalovirus infection
 - Congenital varicella syndrome

6. According to your knowledge, how can cytomegalovirus (CMV) infection be contracted?
 - Sharing eating utensils
 - Contact with cat litter
 - Contact with wet diapers
 - Sharing food and drink
 - Sexual transmission
 - Airborne transmission

- Blood transfusion
7. Which of the following symptoms and conditions can be a result of congenital cytomegalovirus infection? (Select all that apply)
- Limb abnormalities
 - Microcephaly
 - Death
 - Developmental delays
 - Hearing loss
 - Heart defects
 - Visual impairments
 - Asymptomatic infection
 - Anemia
 - Seizures
 - Growth restriction
8. Which of the following strategies is currently useful in preventing congenital cytomegalovirus infection? (Select all that apply)
- Vaccine
 - Drug treatments
 - Hand hygiene
 - Avoidance of saliva
9. Are you aware of any current screening or prevention guidelines for congenital cytomegalovirus for physicians and their pregnant patients?
- Yes
 - No
10. If yes, briefly describe your understanding of these guidelines.
11. Do you think that cytomegalovirus screening and patient counselling should be a priority for physicians?
- Yes
 - No
12. Why or why not?

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