Exploring Physicians' Awareness of Congenital Cytomegalovirus: New Insights from Gorgan, Iran

Running title: Iranian Physicians' Awareness of cCMV: Insights and Gaps

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Abstract

Background: Congenital cytomegalovirus (cCMV) is the most common congenital infection worldwide, often causing long-term disabilities such as sensorineural hearing loss and developmental delays. Despite its significant public health impact, awareness of cCMV among healthcare providers in developing countries, like Iran, remains notably low.

Methods: This study builds on prior research highlighting a significant knowledge gap about cCMV among family physicians in Iran. A re-analysis of existing data was conducted to better understand these gaps and to identify where targeted educational interventions might be most effective. The study reassessed data using 11 out of 15 questionnaire questions to evaluate awareness of CMV, categorizing participants into three levels: weak, intermediate, and adequate awareness based on their knowledge of CMV and cCMV.

Results: Results showed that while 41.9% of participants had adequate general knowledge of CMV, only 32.8% demonstrated adequate knowledge of cCMV, with 39.4% showing weak awareness. Notably, 42.1% of general practitioners displayed a weak understanding of cCMV, underscoring the need for improved education. In contrast, specialists had a higher awareness of general CMV but showed reduced knowledge about cCMV.

Conclusions: The study recommends the integration of comprehensive educational programs into medical curricula and continuous professional development for both general practitioners and specialists. Addressing these knowledge gaps is critical to reducing the spread of cCMV and its associated social and economic burdens, ultimately improving public health outcomes.

Keywords: Cytomegalovirus, Herpesviridae Infections, Congenital Abnormalities, Iran

Introduction

Congenital cytomegalovirus (cCMV) infection is the most prevalent congenital infection worldwide, with substantial public health implications due to its potential to cause severe, long-term disabilities. These disabilities often include sensorineural hearing loss, which can lead to permanent auditory impairment, and developmental delays that affect both cognitive and motor functions. In severe cases, cCMV can also cause visual impairments, seizures, and intellectual disabilities. These complications have profound and lasting effects on the quality of life for affected individuals and their families (1-4).

Despite the high prevalence of cCMV infection, awareness and understanding of the condition among healthcare providers remain alarmingly low, particularly in developing countries like Iran. This knowledge gap significantly hampers the ability to achieve early diagnosis, timely intervention, and effective management of affected infants. Without proper awareness, healthcare providers may overlook or misinterpret the subtle clinical signs of cCMV, delaying essential treatments that could prevent or minimize long-term complications (5). Additionally, inadequate education on cCMV among healthcare professionals restricts the adoption of preventive strategies, such as routine maternal screening, prenatal counseling, and the promotion of hygienic practices during pregnancy, all of which could reduce transmission rates. Given the substantial impact of cCMV on public health, increasing awareness through targeted educational programs and training for healthcare providers is essential. This would improve early detection, optimize care for affected infants, and mitigate the long-term social and economic burden associated with cCMV-related disabilities (6).

Our previous work, "What Family Doctors Know About Congenital CMV: A Regional Survey in Iran," highlighted a significant deficiency in knowledge among family physicians (6). Given the key role of healthcare providers in early diagnosis and prevention of vertical transmission, this lack of awareness is particularly concerning (7,8).

The previous study has overlooked the full extent of the knowledge gap by not prioritizing cCMV-specific data. Re-analysis of the data was conducted to better understand specific gaps in knowledge and identify where targeted educational interventions could be most effective. This deeper evaluation, incorporating recent international studies, aimed to ensure that the findings remain relevant and address the most critical areas for improvement in cCMV awareness.

Methods

To obtain a broader perspective on this community awareness, we endeavored to reassess the data. To do so, we considered 11 questions (Out of 15 questions in the questionnaire), directly related to the knowledge of CMV, as a criterion to evaluate the level of information about CMV infection. Moreover, 8 out of the previous 11 questions served as a benchmark to specifically address the knowledge of congenital CMV infection (cCMV). Accordingly, the participants of this study were categorized into three distinct levels of awareness:

Weak awareness:

Participants with a maximum of 5 correct answers about CMV and 4 correct answers about cCMV.

Intermediate awareness:

Participants with exactly 6 or 7 correct answers about CMV and 5 correct answers about cCMV.

Adequate awareness:

Participants with at least 8 correct answers about CMV and 6 correct answers about cCMV.

Results

Generally, the study outcomes demonstrated a considerable level of CMV awareness among the target population, with 41.9% exhibiting adequate knowledge and 40.4% demonstrating intermediate awareness (Table 1). On the flip side, it was alarming to find that only 32.8% of the participants possessed adequate knowledge about cCMV, 27.8% showed intermediate knowledge, and 39.4% had weak knowledge. What's more, a more detailed analysis displayed more disquieting data regarding cCMV awareness. Based on the findings, while the majority of general practitioners, who comprise the majority of the participants, possessed an average level of awareness regarding CMV infection, approximately 42.1% of them exhibited a subpar level of awareness concerning cCMV (Table 2).

The obtained data evidenced a satisfactory level of awareness among specialists regarding CMV infection. However, when the same group was assessed in terms of their level of awareness of cCMV, the percentage of individuals with an above-average level of awareness dropped to 46.6%. This could be attributed to the fact that experts from various disciplines were involved in the study, which may have led to a dispersion of knowledge on the subject.

Table 1. The level of awareness of the target community about cytomegalovirus infection

Profession	CMV Awareness level			Total count
	Weak (≥ 5)	Average (6 or 7)	Appropriate (≤ 8)	
General practitioner	23 (16.4 %)	67(47.9 %)	50 (35.7 %)	140
Medical specialist	12 (20.7 %)	13 (22.4 %)	33 (56.9 %)	58
Total	35 (17.7 %)	80 (40.4 %)	83 (41.9 %)	198

Table 1. The level of awareness of the target community about congenital cytomegalovirus infection

Profession	cCMV Awareness level			Total count
	Weak (≥ 4)	Average (5)	Appropriate (≤ 6)	
General practitioner	59 (42.1%)	43 (30.7%)	38 (27.1%)	140
Medical specialist	19 (32.8%)	12 (20.7%)	27 (46.6%)	58
Total	78 (39.4%)	55 (27.8%)	65 (32.8%)	198

Altogether, although the current data reported an intermediate to adequate level of CMV awareness among the population of this study, this community awareness declined to a weak level (38.4%) in the case of cCMV knowledge, mostly among general practitioners. Better to say, the analysis documented that a mere 16.4% of general practitioners possess inadequate knowledge of CMV, while an alarming 42.1% lack sufficient understanding of cCMV, highlighting the importance of effective interventions to improve knowledge of cCMV to reduce the spread of the infection and its associated social and economic consequences (Table 1 and 2).

Discussion

The findings of this study expose a critical and concerning gap in the awareness and knowledge of cCMV among healthcare providers in Iran, particularly family physicians. Given the vital role these practitioners play in the early detection and management of cCMV, this knowledge

deficiency is especially alarming. As the most common congenital infection globally, cCMV is a leading cause of lifelong disabilities such as sensorineural hearing loss and developmental delays. The limited understanding of cCMV's risks and outcomes among key medical professionals underscores the pressing need for targeted educational initiatives. Improving awareness and training is essential to enhance early intervention and reduce the long-term impact of this preventable yet under-recognized infection (1,9-11).

A stark contrast emerges when comparing cCMV awareness among Iranian healthcare providers to that in developed countries like Japan and France. In Japan, a study by Okahashi et al. (2021) revealed that 69% of healthcare providers were familiar with cCMV, with obstetricians and pediatricians exhibiting the highest levels of knowledge (12,13). France has similarly made strides in cCMV awareness, with targeted educational interventions significantly enhancing the understanding and management of the infection among medical professionals (14,15). These international comparisons highlight an urgent need for focused educational programs in Iran to bridge the troubling knowledge gap and improve cCMV care.

The re-analysis of the data was particularly insightful, revealing that the initial study may have underestimated the depth of the knowledge gap by not fully disaggregating the data related to cCMV. By categorizing the participants' awareness into distinct levels—weak, intermediate, and adequate-the re-analysis provided a clearer picture of the specific areas where knowledge is lacking. Notably, it highlighted that while a significant percentage of general practitioners had a reasonable understanding of CMV in general, a much smaller proportion demonstrated adequate knowledge specifically about cCMV. This distinction is crucial because it points to a targeted area where educational interventions can be most impactful (5,6,15,16). Moreover, the findings suggest that the dispersion of knowledge across various medical disciplines might be contributing to the lower levels of cCMV awareness. Specialists who are not directly involved in maternal or neonatal care may not prioritize cCMV knowledge, leading to gaps in understanding that could affect patient outcomes. This is in contrast to countries like Japan, where specialists most directly involved with cCMV, such as obstetricians and pediatricians, showed the highest levels of awareness (12,17).

These findings underscore the urgent need for robust, continuous educational programs tailored to address the knowledge gap surrounding cCMV. Integrating targeted education into both undergraduate medical curricula and specialist training is crucial to ensuring future healthcare providers are well-equipped to manage and prevent this prevalent infection. Furthermore, incorporating cCMV education into ongoing professional development programs would help current practitioners stay informed about best practices. Expanding access to up-to-date resources and evidence-based guidelines is essential to improving awareness and enabling healthcare professionals to deliver timely interventions, ultimately reducing the long-term public health impact of cCMV.

It is important to acknowledge the limitations of this study, which provide valuable context for interpreting the findings. The relatively small sample size and geographic focus on a specific region of Iran may limit the generalizability of the results, potentially overlooking regional variations in cCMV awareness. To gain a more comprehensive understanding of cCMV knowledge across the country, larger-scale studies involving more diverse populations are essential. Additionally, the reliance on self-reported data raises the possibility of bias, as participants may overestimate their knowledge or provide socially desirable responses. Future research should aim to overcome these limitations by incorporating objective knowledge

assessments and expanding the study's geographic scope to ensure more robust and accurate insights into cCMV awareness nationwide.

Conclusion

In conclusion, while overall awareness of CMV among Iranian healthcare providers may be satisfactory, there remains a critical and urgent need to strengthen their understanding of cCMV specifically. This knowledge gap poses significant challenges in preventing the spread of cCMV and reducing its long-term social and economic burdens. Implementing targeted educational strategies is essential to bridge this gap. By drawing insights from successful models in countries like Japan and France, the Iranian medical education system can design effective programs that enhance the recognition, management, and prevention of cCMV. These efforts will ultimately lead to improved health outcomes for affected populations and a more comprehensive public health response to this prevalent infection.

List of Abbreviations

CMV: Cytomegalovirus; cCMV: Congenital Cytomegalovirus

Ethical Statement

Not applicable.

Consent for Publication

Not applicable.

Availability of Data and Materials

Not applicable.

Competing Interests

The authors declare that they have no competing interests.

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Authors Contributions

PV, MY, SDH, MM, AN, AT: conception and design, writing the initial manuscript, reviewed and revised the final version of the manuscript. All authors read and approved the final manuscript.

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Data availability Statement

All data generated or analyzed during this study are included in this article and its supplementary material files. Further inquiries can be directed to the corresponding author

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