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Short Communication

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Incidence of Infectious Mononucleosis in Universities and U.S. Military Settings

Yolonda J Williams-Harmon[1], Leonard A Jason[1,*] and Ben Z. Katz[2]

Abstract

Objective: The reported incidence rates for Infectious Mononucleosis (IM) within universities and military settings vary widely from study to study. Several factors may have contributed to the discrepancy in these incidence rates include misdiagnosis, ambiguity in the reported sample populations, and number of students who visited and were diagnosed at their campus's health service centers. The current review examines previously reported literature on the incidence rate in universities and military settings of infectious mononucleosis taking into account these possible confounding factors.

Methods: Articles examined for the literature review were selected by searching several databases within Google Scholar and PubMed.

Results: Variance in the incidence rates could be due to differences in the populations studied, true geographic or epidemiologic variation or inconsistent number of students who visited and were diagnosed at their campus's health service centers.

Keywords

Infectious mononucleosis; Epstein-Barr virus; College students; Incidence of mono

Introduction

Infectious Mononucleosis (IM), more commonly referred to as mono, or the "kissing disease", is an infection transmitted through infected saliva. Over 90% of IM is caused by a primary Epstein-Barr virus (EBV) infection, and is common among adolescents and young adults in Western society. EBV infects only humans and persists in the body (in blood and secretions) lifelong [1]. Symptoms associated with IM include fever, sore throat, lymphadenopathy/enlarged lymph nodes, and fatigue. EBV is a member of the herpes virus family, and over 95% of adults worldwide are infected with EBV [2-4].

EBV infection can be asymptomatic, cause mild, nonspecific symptoms, or cause the full blown illness of IM, with symptoms and fatigue lasting up to 6 months or more. IM symptoms usually reach their peak one week after illness onset, and then usually start to resolve over the following one to three weeks [5]. Persons can experience a significant loss of time from school or work as a result of fatigue and other symptoms. Some studies reported IM to be the second most common cause of college student's admission into infirmaries, after acute respiratory diseases. We reviewed the literature regarding the incidence rates of IM in universities and military settings [6].

Methods

Procedures

Articles examined for the literature review were selected by searching several databases within Google Scholar and PubMed. Searches were conducted using the Boolean phrases: "infectious mononucleosis", "infectious mono incidence", "infectious mono and college students", and "mono incidence in college universities".

Results

The incidence of IM in the United States is estimated to be about 500 cases per 100,000 per year. The estimated annual IM incidence rate for young adults between ages of 15 and 19 ranges from about 200 – 800 cases per 100,000 [4]. Data collected over 3 decades ago revealed that IM is more prevalent in populations with young adults who function or live in close proximity to each other, such as college students or active military personnel [7-9]. The annual incidence rate among these Populations can be as high as 11 to 48 cases per 1000 [10]. Studies that examined IM among college students revealed varying mono incidence rates (Table 1), with reports of 1% to 5% of university students developing IM annually. Goode and Coursey; and Sumaya reported a lower incidence of IM among college students who had prior tonsillectomies [11-13]. The incidence of symptomatic infection is approximately 30 times higher in whites than blacks in the United States, probably due to socioeconomic factors, since in lower socioeconomic groups, primary EBV infection is acquired at a younger age, at which time it is much less likely to be symptomatic [14,15].

Evans and Robinton conducted an epidemiology study at a New England university during the winter of 1948-1949, which showed that among the 2,267 students, there were 47 cases of IM, for an incidence of 2,100 per 100,000 for that year [16]. Later, Evans reported during the 1950's, the University of Wisconsin reported 450 students per 100,000 were admitted to the health center for IM each academic year during a seven-year period [17]. During the late 1960s and early 1970s, the American College Health Association (ACHA) collaborated with the Centers for Disease Control (CDC) to study IM in 19 American colleges and universities [6]. Sample sizes for the various schools' undergraduate populations varied from 743 to 32, 277 [18]. IM incidence rates varied as well, with the overall annual IM incidence being 1.1%. Princeton University had the highest annual IM incidence at 2.2% and the University of Hawaii had the lowest with a rate of .11%.

One study showed that the incidence for females was higher than for males during freshman and sophomore years, and conversely, was higher for males than females during the junior and senior years. No gender differences were seen in the study by Luzuriaga and Sullivan [13]. Although some reports have suggested that IM is more common during spring and fall months, no significant seasonal variation was

***Corresponding author:** Leonard A Jason, Center for Community Research, DePaul University, 990 W. Fullerton Ave., Suite 3100, Chicago, USA, Tel:773-325-2018; E-mail: ljason@depaul.edu

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Table 1: Literature Review of Mono Incidence.

Year	Title	Author	Journal Source	Sample	Students Diagnosed w/ Mono (N =)	Annual Infectious Mono Rate
1960	Infectious Mononucleosis in University of Wisconsin Students: Report of a Five-Year Investigation	Evans	American Journal of Hygiene	100,000 undergraduate students	**450**	**0.45%** ǂ
1971	Prospective Studies of a Group of Yale University Freshmen. I Occurrence of Infectious Mononucleosis	Sawyer, Evans, Niederman, & McCollum	The Journal of Infectious Diseases	355 Freshmen	**17**	**4.79%**
1972	Infectious Mononucleosis: Epidemiologic Patterns at United States Colleges and Universities	Brodsky & Heath	American Journal of Epidemiology	256,463 undergraduate students from 19 different universities	**2,851**	**1.11%**
1974	Infectious Mononucleosis at the United States Military Academy: A Prospective Study of a Single Class Over 4 Years	Hallee, Evans, Niederman, Brooks, & Voegtly	Yale Journal of Biology and Medicine	1,401 undergraduate students	**53**	**3.78%** ǂǂ
1976	Physical Diseases in University Students	Finlay	British Medical Journal	817 undergraduate students	**38**	**4.65%**
1979	Incidence of Infectious Mononucleosis at the Universities of California and Hawaii	Chang, Char, Jones, & Halsted	The Journal of Infectious Diseases	16,007 UCD students (undergrad + grad); 21,854 UHM students (undergrad + grad)	**194/UCD; and 8/UHM**	**1.21% UCD; and 0.037**
2006	A Cohort Study among University Students: Identification of Risk Factors for Epstein-Barr Virus Seroconversion and Infectious Mononucleosis	Crawford et al.	Clinical Infectious Diseases	2,006 undergraduate students	**19**	**0.95**
2013	Behavioral, Virologic, and Immunologic Factors Associated with Acquisition and Severity of Primary Epstein-Barr Virus Infection in University Students	Balfour et al.	Journal of Infectious Diseases	546 Freshman	**51**	**9.34%**

ǂ Incidence rate represents a time period of 5 years

ǂǂ Incidence rate represents a time period of 4 years

recognized in Luzuriaga and Sullivan [4,8,18]. Fewer cases of IM were reported during Thanksgiving and Christmas vacations, holidays, and spring break, likely because students who became ill at home during vacation were being diagnosed by their family physician rather than their universities' health centers [4].

Chang, Char, Jones, and Halstead investigated the incidence of IM at the universities of California and Hawaii from 1971 through 1977 to determine whether the annual incidence rate of IM at the University of Hawaii was as low as previously reported [8,19]. The sample populations for this study included students enrolled at the University of California at Davis (UCD) and University of Hawaii at Manoa (UHM). Findings from the study revealed the average IM incidence rate for students attending UHM was 37 IM cases per 100,000 per academic school year, while the IM incidence rate at UCD was 1,212 cases per 100,000 per academic school year, thus confirming the much lower incidence of IM in Hawaii seen in previous studies.

There have been several studies in military populations as well. For example, an assessment of IM incidence rates in the armed forces revealed hospital admission rates of 140 to 228 per 100,000 making IM among the top five infectious diseases of significance in the military and the fourth highest cause of days of hospitalization among Navy and Marine personnel [20]. In a prospective study of 1,401 entering cadets in the United States Military Academy, 63.5% or 890 cadets enrolled were already infected with EBV. Of the 437 cadets without EBV antibodies, 12.4% or 54 became infected with EBV during their freshman year, and 15 were diagnosed with IM, giving an incidence rate of 1,100 per 100,000. Reported incidence rate for IM among college universities' students and military cadets has ranged from 1% to 5% annually [21].

Comments

Variance in the incidence rates could be due to differences in the populations studied, true geographic or epidemiologic variation or inconsistent number of students who visited and were diagnosed at their campus's health service centers.

Ambiguity in reported sample populations

Studies that examined the IM incidence rates among college students and military cadets might have reported different incidence rates due to their studying different sample populations. For example, studies such as Sawyer, Evans, Niederman, McCollum's and Balfour, Odumade, Schmeling, Mullan, Ed, Knight, Zezina, Thomas, and Hogquist's sampled populations that were male and/or freshmen, whereas studies such as Finlay and Chang, Char, Jones, and Halsted examined all undergraduates or the entire student body enrolled in the university [12,22]. Since the younger the subject, the more likely they are to be EBV sero negative, freshmen are more likely to be infected with EBV and develop mono than upper classmen [19,23-25]. It is also possible that incidence rates differ in different regions; e.g., rates in Hawaii actually appear to be lower than elsewhere.

Number of students who visited and were diagnosed with mono at the health service centers

Finally, students who attended universities and lived on campus in dormitories or off campus in university housing would more likely use the university health service for their care. Students who lived at home would be more likely to visit their family physicians and thus the diagnosis of IM might be missed.

Limitations

This literature review provides information about the incidence of mono in college universities and military settings. However, one limitation is the lack of current prospective studies conducted examining this phenomenon. The majority of the research studies examining this group were conducted over thirty years ago. More current research is warranted.

Conclusions

IM is not considered a serious illness; however, in its acute phase, it can significantly impact individuals' daily activities. Some studies reported that IM was the second most common cause for college students' admission into infirmaries. Varied IM incidence rates reported in the literature makes it difficult to gauge the actual impact of IM on university students as a whole [6]. Factors such as varying epidemiology or confounders such as different sample populations studied, or not capturing all students with mono because not all visit the health center, may have contributed to the varied incidence rates reported. Future studies that examine IM incidence rates among college students should be standardized and comparable. To achieve this, there needs to be a consensus for diagnostic criteria used for students being studied and complete follow-up needs to be assured.

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Author Affiliations

Top

[1]*Yolonda J. Williams-Harmon and Leonard A. Jason are at Center for Community Research, DePaul University, 990 W. Fullerton Ave., Suite 3100, Chicago, USA*

[2]*Ben Z. Katz is at Lurie Children's Hospital at Northwestern University, Chicago, USA*

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