



Abstract

Background: Guatemala is a developing country in Central America with a high burden of HIV and endemic fungal infection. *H. capsulatum* and *C. neoformans* alone are the major causes of HIV related deaths. The main fungal infections in the country are respiratory, gastrointestinal and dermatologic. Among respiratory fungal infections the most prevalent is *H. capsulatum*, however other endemic fungi infections have been reported. We have attempted a preliminary estimate of fungal infections in Guatemala.

Methods: A full literature search was done to identify all epidemiology papers reporting fungal infections from Guatemala. We used specific populations at risk and fungal infection frequencies in the population to estimate national incidence or prevalence. 2012 statistics were derived from Guatemala's National Statistics Institute, Public Health Department, the UNGASS Country progress reports, and WHO TB world report and scientific reports.

Results: The estimated population in Guatemala for 2011 was 14.7 million inhabitants, 42.3% were younger than 15 and 6.5% older than 60. There is an estimated 65,000 people with HIV infection with an incidence rate of 790 per year of whom 605 (64%) present with CD4 counts below 200. The estimated prevalence of opportunistic fungal infections was as follows: 1.) 2,470 cases of disseminated histoplasmosis; 2.) 1,430 cases of cryptococcal meningitis; 3.) 3,050 cases of PCP and 4.) 7,750 cases of esophageal candidiasis.

In the general population estimated cases of ABPA are 4,922 assuming a 2.42% prevalence of asthma and 2.5% of ABPA among adult asthmatics. TB incidence and prevalence rate for 2011 were 61 and 111 per 100,000 respectively. Post TB chronic pulmonary aspergillosis estimates are 300 cases per year.

Recurrent candidal vaginitis in reproductive age women are estimated as 158,760 cases per year. Estimation for other fungal diseases is inaccurate, however *Paracoccidioides brasiliensis* has been reported.

Conclusions: True fungal infection prevalence in Guatemala is unknown. Most accurate data comes from HIV studies. Tools and training for improved diagnosis are needed. Additional research on prevalence is needed to employ public health measures towards treatment and improving the reported data of fungal diseases.

Introduction

Fungal infections have been increasingly recognized as culprits of serious invasive diseases. Affecting primarily those with impaired immunity, they can also cause disease in the immunocompetent. The tropical characteristics of the region make Guatemala an ecological niche for certain fungi, of which *Histoplasma capsulatum*, *Cryptococcus neoformans*, *Coccidioides posadasii* and *Paracoccidioides brasiliensis* have been reported causing disease. HISTOPLASMA MUERTE. More important is the impact that these infections have on those with altered immunity. In Guatemala we know that those with HIV represent a significant at risk population for the acquisition of fungal infection, however, no one has dealt with the burden in other populations such as those with malignancies, solid organ transplant recipients and those who undergo therapy with cytotoxic agents or monoclonal antibodies. Additionally, there are no reports on azole resistant candidiasis which can be a source of poor outcomes on those with long stays at ICUs.

Methods

A literature search was done for demographics on Guatemala's National Statistics Institute¹ to retrieve the number of people living in Guatemala with its gender and age distribution and from the UNGASS country progress report² the estimated number of HIV cases with incidence rates; and for reports on fungal infections in Guatemala the Public Health Department report on year morbidity and scientific papers reporting on fungal infections in Guatemala and prevalence in other populations.

Estimated prevalence for fungal infections were calculated with the expected rates on our at risk population⁴ as follows:

For disseminated histoplasmosis, cryptococcal meningitis and PCP we estimated the number of cases based on prevalence found at the time of HIV infection diagnosis in an urban clinic in Guatemala and the estimated number of people living with HIV according to the UNGASS Progress Report. For esophageal candidiasis, the expected cases were 20% of those HIV patients not receiving ARV therapy and an additional 5% of those on ARV therapy.

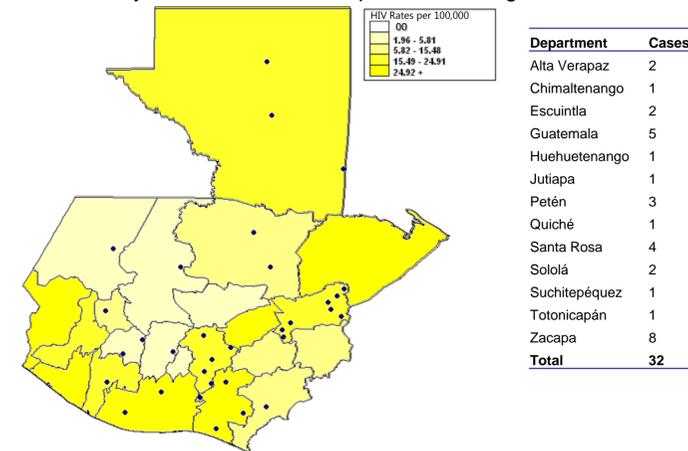
For ABPA⁵, we calculated the total cases of asthma based on a prevalence of 2.42% in the population, and that of ABPA on asthmatics of 2.5%. For those with severe asthma with fungal sensitization, of those with asthma assuming 6% would be severe, and a prevalence of fungal sensitization among them of 34% the total number of cases was obtained.

Post TB Chronic Pulmonary Aspergillosis⁶ cases were obtained with a 5 year point prevalence of TB, the proportion of those developing cavities, and of those the proportion developing chronic aspergillosis.

For recurrent candidal vaginitis the number of cases was based on a 5% expected prevalence on women aged 15 to 50 years old.

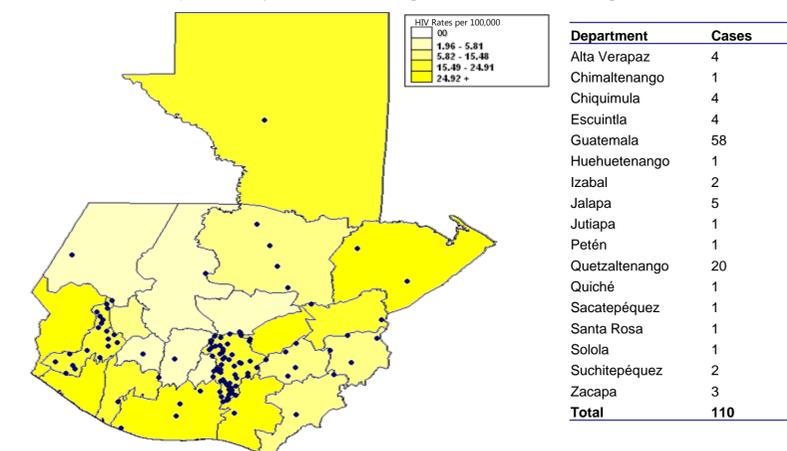
Results

Figure 1. HIV rates³ per department and histoplasmosis cases reported by the Public Health Department during 2012



*According to Guatemala's public health department, there were a total of 33 cases of histoplasma infections nationwide in 2012.

Figure 2. HIV rates³ per department and histoplasmosis cases reported by a referral diagnostic center during 2012



*A referral diagnostic laboratory in Guatemala City reported a total of 110 cases of disseminated histoplasmosis in 2012

Conclusions

- There is under reporting of fungal infections in Guatemala due to the lack of appropriate resources and knowledge on the topic
- Even though fungal opportunistic infections are correctly diagnosed in the HIV population, these are not reported by the Public Health Department.
- The impact of mycotic infections in Guatemala remains unrecognized
- A national reference laboratory is needed to educate and introduce new diagnostic techniques, while promoting awareness of the importance of serious fungal infections.
- There is a need to improve the national reporting system to determine the impact of serious fungal infections among HIV and general population

References

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5. To, et al. Global asthma prevalence in adults: findings from the cross-sectional world health survey. BMC Public Health. 2012 12:204
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Table 1. Population Projections, HIV and TB rates and Expected Fungal Infection Cases

Total Population, Millions[^]	14.7
Male	7.2 (48%)
Female	7.5 (51%)
Age, Millions (%)	
<15 years old	6.2 (42.3)
>15 and < 60	7.5 (52)
>60 years old	.95 (6)
HIV[*]	
Total cases	65,000
Incidence rate per 100,000	790
Tuberculosis Rates per 100,00[*]	
Incidence	61
Prevalence	111
Opportunistic Fungal Infection Estimates in HIV+ persons	
Disseminated Histoplasmosis	2,470
Cryptococcal Meningitis	1,430
PCP	3,050
Esophageal Candidiasis	7,750
Other Fungal Infection Estimates, cases	
ABPA	4,922
Post-TB Chronic Pulmonary Aspergillosis	300
Recurrent candidal vaginitis	158,760
Total Expected Fungal Infections	178,682

[^]Estimated projection of Guatemala's population for 2011
^{*}Projections for 2010. UNGASS Country Progress Report 2010.
^{*}Rates reported by the WHO for 2011 Tuberculosis Profile with a total population of 15 million