



Estimated burden of fungal disease in Uganda

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Abstract

Background

In Uganda, as elsewhere in Sub Saharan Africa, the HIV epidemic has highlighted cryptococcal and Candida infections as important opportunistic fungal infections. However, the burden of other fungal diseases is not well described. Estimating the burden of these infections in Uganda is an important first step in highlight gaps in diagnosis, care and treatment for fungal illnesses.

Methods

All epidemiological papers of fungal diseases in Uganda were reviewed. For infections where there is no Ugandan data, global data or data from East Africa were used. Population statistics were obtained from World Bank, HIV statistics from the Uganda AIDS Indicator survey (UAIS), pregnancy rates from the UNFPA, and TB rates from WHO statistics (all 2011).

Results

Of 35 million Ugandans, 1.1million have HIV and an estimated 9.2% (101,000) have a CD4 count <200 cells/ μ L. The cryptococcal antigen positivity rate is well defined (Leitchy 2010, Meya 2010, Parkes-Ratanshi 2011), an estimated 2,834 cryptococcal cases per year. PCP rates in hospitalized HIV patients suggest around 748 cases per year (Worodria 2012). HIV related oral and vaginal Candida rates have been described pre-ART and post-ART, which gives an estimate of 41,329 cases/year (Parkes-Ratanshi, 2011).

Recurrent vaginal candidiasis is estimated to be 5-8% worldwide in women (=312,950 Uganda women/ year). Prevalence of Candida in pregnant Ugandan women is 60% = 651,600 cases/year (Tann 2006). In 2011 Uganda had 38,444 cases of pulmonary TB (estimated 5,000 deaths). Using previously described calculations (Denning 2011) this gives an estimate of between 497 to 3816/year of chronic pulmonary aspergillosis post TB. Asthma affects 4.4% adults in East Africa (GINA, 2004), contributing 40,392 asthma-related fungal infections.

There are no data on tinea capitis or fungal keratitis in Uganda, but in Kenya Tinea affects up to 10% of all school children per year (Uganda= approximately 1,300,000/year.)

Summary

There are an estimated 1 million fungal infections per year in Uganda, excluding tinea capitis. Cryptococcus and PCP alone may cause around 30,000 deaths per year. Despite cryptococcal research in Uganda, overall fungal disease burden in Africa is not well described. As chronic diseases such as asthma increase, and cancer treatments is more widely available, it will be important to improve diagnostics and research, as well as to educate medical staff on the prevention, care and treatment of a wider range of fungal diseases.

Background

The HIV epidemic in Uganda, as elsewhere in Sub-Saharan Africa, has focus research priorities on this HIV and related opportunistic infections. Whilst non communicable diseases including respiratory conditions and malignancies are growing¹ these conditions are relatively unstudied, and there is a paucity of information related to their epidemiology and treatment. Therefore, for Uganda, we have been able to estimate HIV related fungal infections with mainly locally produced information, but the estimated burden of non HIV related infections has been more challenging.

Methods

Estimates have largely relied on National statistics for the population and other conditions. The population of Uganda was estimated to be **34,509,205**². The Uganda National Surveillance Report 2011³, stated the following;

- There are an estimated 1,100,000 infected with HIV in Uganda
- 3.5% (38500) of those with HIV have a CD4 count under 100
- 9.2% (101,200) of those with HIV have a CD4 count under 200
- Of those eligible for ART eligible 61% are receiving ART

There are around 50 ICU beds in the country, and there are 2 centres providing chemotherapy nationally. There are 7345000 women in Uganda aged 15-45years. There are 1448000² pregnancies per year and an estimated 1086000 women are pregnant at any one time.

Results

Cryptococcal Disease

Much of the recent work on cryptococcal disease has taken place in Sub Saharan Africa, and this been driven by high mortality in HIV patients in Sub Saharan Africa from cryptococcal disease⁴. Work in asymptomatic HIV patients starting ART suggests that around 7.1%with CD4 counts < 100⁵ or 2.8% under 200⁶. Using the Ugandan National HIV surveillance report there are an estimated 38500 with CD4 counts <100 (38500x7.1%=2733) or an estimated 101,200 under 200 (101,200 x2.8% = 2834), so we have used an average of these, which gives 2783 developing cryptococcus per year. For survival, we used data from Kambugu which estimated 0% survival by 6 months pre ART and 41% 6 month survival post ART⁷. 61% under 200 are receiving ART, which gives a mortality of (2783 x 61% x 59%) 1001 cases, and 39% not on ART have 100% mortality, which is 1085 cases. Therefore, total overall yearly mortality is approximated at 2086.

Pneumocystis Jirovecii Pneumonia (PCP)

An estimated 2-4% of HIV positive patients with CD4 under 200 admitted to hospital⁸. Therefore, (101,200x 2%) 2024 HIV admissions, of these an estimated 36.8% had PCP, which gives 748 cases of PCP per year⁸. Of these 10% die =75⁹

HIV related Candida

In those prior to starting ART oesophageal candida occurs at a rate of affects 21.3 /100PYO (in 39,000 not on ART with CD4 <200) which is approximately 8407cases per year. Rates of oral and vaginal candida are 61.4/100PYO in 39,468 not on ART with CD4 <200) which equals approximately 24,290 per year. In those started on ART, oesophageal candida is around 2.39 /100PYO (in 61,732 people) making an estimated 1475 cases per year, oral and vaginal candida rates are 11.6/100 PYO (in 61,732 people) with an estimated 7157 cases per year⁶

Non HIV related candida

Pregnant women in Uganda have a rate of 60% candida¹⁰, which gives 651,600 pregnant women with candida at any time. Estimated rates of recurrent Candida vaginitis (>4x/year) are 5% of adult women¹¹ and non pregnant women (7345000 of reproductive age minus1086000 pregnant women = 6259000 women) x 5% candida = 312,950 women.

Chronic Pulmonary Aspergillous

38444 PTB cases per year, 5000 deaths from TB per year (including EPTB, so will be upper limit)¹ therefore, there are 33444 new TB survivors per year alive. There are an estimated 2341 to 11705 with cavities, which gives a CPA between 280 to 2572 cases. Those without cavities are between 21738 to 31102 cases which gives CPA numbers of 217 to 1244¹². The overall estimate is 497 to 3816 With a mortality of 15% the estimated CPA mortality is 572 cases.

Invasive aspergillosis

There are no good epidemiological estimated on leukaemias or COPD in Uganda, so using an approximation of 1 in 100,000 population, there are an estimated 345 per year, with a 10% mortality¹³.

ABPA and SAFS

Asthma rates in Uganda are 4.4% using the GINA data¹⁴. The number of adults in Uganda is 17,000,00 and therefore, adult asthma affects approximately 748,000. The rates of allergic bronchopulmonary aspergillosis (ABPA) is 2.2% in adult asthmatics, equalling 15,708. The rate of severe asthma with fungal sensitisation (SAFS) is 3.3% adult asthmatics, which gives a Ugandan estimate of 24,684¹⁵.

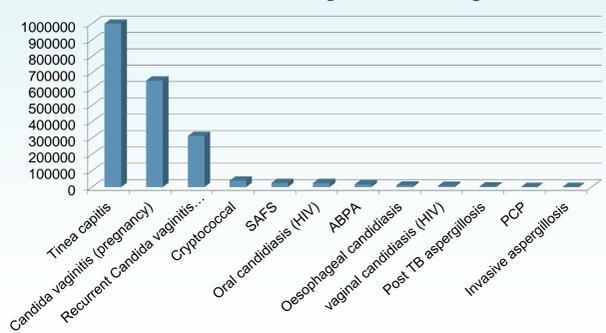
Dermatophyte Infections

There is no data on tinea capitis and fungal keratitis in Uganda, but tinea capitis affects 10% of all Kenya schoolchildren¹⁶. 10% of Ugandan school children would be around 1,300,000.

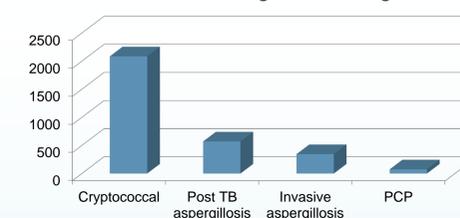
Summary of fungal infection incidence in Uganda

Infection	Incidence /rate in specific population	Special population	Total number affected in Uganda	Estimated deaths from condition in Uganda
Cryptococcal	5.8%	CD4 count <100	2783	2086
PCP	36.8%	HIV +ve hospital admissions CD4<100	748	75
Oral/ vaginal candidiasis	61.4 /100PYO 11.6 /100PYO	HIV pre ART <200CD4 HIV on ART <200 CD	24,290 7157	-
Oesophageal candidiasis	21.3 /100PYO 2.39 /100PYO	HIV pre ART <200CD4 HIV on ART <200 CD4	8407 1475	-
Invasive aspergillosis	10%	AML patients	345	345
Chronic pulmonary aspergillosis post TB	12-22% 1-4%	with cavities without cavities	280 to 2572 217 to 1244	572
Allergic bronchopulmonary aspergillosis (ABPA)	2.2%	Adult asthmatics	15,708	?
Severe asthma with fungal sensitisation (SAFS)	3.3%	Adult asthmatics	24,684	?
Candida vaginitis	60%	Pregnant women	651,600	-
Recurrent Candida vaginitis (>4x/year)	5%	Women 15-45 yr	312,950	-
Fungal keratitis	?	?	?	-
Tinea capitis	?	School children	?1,000,000	-
Histoplasmosis, mucormycosis, coccidiomycosis, paracoccidiomycosis	No data available	NA	NA	?
TOTAL			1,089,680 to 2,000,000	Up to 3000

Estimated Incidence of Fungal Infections in Uganda



Estimated Annual Fungal Deaths in Uganda



Conclusion

Whilst estimates for fungal burden in HIV are Uganda specific, the estimates for non HIV related fungal infections are mainly extrapolated from global or regional data. Nevertheless, there is a substantial burden of fungal infection in Uganda affecting up to 2million people (up to 6% of the population), and up to 3000 deaths per year. Given this large burden fungal diseases are relatively understudied, and under diagnosed in Uganda. As the number of people living with HIV in Uganda continues to rise, and the number of people with non communicable diseases such as COPD and cancers treated with chemotherapy rises, we need to urgently address gaps in knowledge, diagnosis, and management of fungal disease in Uganda and SubSaharan Africa.

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