Comparative Yield of Different Diagnostic Tests for Tuberculosis among People Living with HIV in Western Kenya.


PMID: 27023213

Abstract

BACKGROUND:

Diagnosis followed by effective treatment of tuberculosis (TB) reduces transmission and saves lives in persons living with HIV (PLHIV). Sputum smear microscopy is widely used for diagnosis, despite limited sensitivity in PLHIV. Evidence is needed to determine the optimal diagnostic approach for these patients.

METHODS:

From May 2011 through June 2012, we recruited PLHIV from 15 HIV treatment centers in western Kenya. We collected up to three sputum specimens for Ziehl-Neelsen (ZN) and fluorescence microscopy (FM), GeneXpert MTB/RIF (Expert), and culture, regardless of symptoms. We calculated the incremental yield of each test, stratifying results by CD4 cell count and specimen type; data were analyzed to account for complex sampling.

RESULTS:

From 778 enrolled patients, we identified 88 (11.3%) laboratory-confirmed TB cases. Of the 74 cases who submitted 2 specimens for microscopy and Xpert testing, ZN microscopy identified 25 (33.6%); Xpert identified those plus an additional 18 (incremental yield = 24.4%). Xpert testing of spot specimens identified 48 (57.0%) of 84 cases; whereas Xpert testing of morning specimens identified 50 (66.0%) of 76 cases. Two Xpert tests detected 22/24 (92.0%) TB cases with CD4 counts <100 cells/μL and 30/45 (67.0%) of cases with CD4 counts ≥100 cells/μL.
CONCLUSIONS:

In PLHIV, Xpert substantially increased diagnostic yield compared to smear microscopy and had the highest yield when used to test morning specimens and specimens from PLHIV with CD4 count <100 cells/μL. TB programs unable to replace smear microscopy with Xpert for all symptomatic PLHIV should consider targeted replacement and using morning specimens.

The journey to improve the prevention and management of childhood tuberculosis: the Kenyan experience.

Maleche-Obimbo E, Wanjau W, Kathure I.


PMID: 26564539

Abstract

Child tuberculosis (TB) cases in Kenya, a high TB burden country, constitute more than one tenth of all TB cases. This paper describes Kenya's efforts in the past decade to increase awareness about policy, improve leadership and combat the multiple challenges faced in the diagnosis and management of children presumed to have TB. We describe the increasing advocacy and involvement of pediatricians and the child health sector with the National TB Programme, and the resulting improvement in leadership, policy, child-specific guidelines and training materials, health worker capacity, and the implementation of prevention and cure of child TB.

Tuberculosis and latent tuberculosis infection among healthcare workers in Kisumu, Kenya.

Agaya J, Nnadi CD, Odhiambo J, Obonyo C, Obiero V, Lipke V, Okeyo E, Cain K, Oeltmann JE.


PMID: 26376085

Abstract

OBJECTIVE:

To assess prevalence and occupational risk factors of latent TB infection and history of TB disease ascribed to work in a healthcare setting in western Kenya.
METHODS:

We conducted a cross-sectional survey among healthcare workers in western Kenya in 2013. They were recruited from dispensaries, health centres and hospitals that offer both TB and HIV services. School workers from the health facilities' catchment communities were randomly selected to serve as the community comparison group. Latent TB infection was diagnosed by tuberculin skin testing. HIV status of participants was assessed. Using a logistic regression model, we determined the adjusted odds of latent TB infection among healthcare workers compared to school workers; and among healthcare workers only, we assessed work-related risk factors for latent TB infection.

RESULTS:

We enrolled 1005 healthcare workers and 411 school workers. Approximately 60% of both groups were female. A total of 22% of 958 healthcare workers and 12% of 392 school workers tested HIV positive. Prevalence of self-reported history of TB disease was 7.4% among healthcare workers and 3.6% among school workers. Prevalence of latent TB infection was 60% among healthcare workers and 48% among school workers. Adjusted odds of latent TB infection were 1.5 times higher among healthcare workers than school workers (95% confidence interval 1.2-2.0). Healthcare workers at all three facility types had similar prevalence of latent TB infection (P = 0.72), but increasing years of employment was associated with increased odds of LTBI (P < 0.01).

CONCLUSION:

Healthcare workers at facilities in western Kenya which offer TB and HIV services are at increased risk of latent TB infection, and the risk is similar across facility types. Implementation of WHO-recommended TB infection control measures are urgently needed in health facilities to protect healthcare workers.

A review of data quality of an electronic tuberculosis surveillance system for case-based reporting in Kenya.

Sharma A, Ndisha M, Ngari F, Kipruto H, Cain KP, Sitienei J, Bloss E.


PMID: 26009610

Abstract

BACKGROUND:

Kenya recently transitioned from a paper to an electronic system for recording and reporting of tuberculosis (TB) data.
METHODS:

During September-October 2013, the data quality of the new system was evaluated through an audit of data in paper source documents and in the national electronic system, and an analysis of all 99 281 cases reported in 2012.

RESULTS:

While the new electronic system overall is robust, this assessment demonstrated limitations in the concordance and completeness of data reaching the national level.

CONCLUSIONS:

Additional oversight and training in data entry are needed to strengthen TB surveillance data quality in Kenya.

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Experience in implementing a quality management system in a tuberculosis laboratory, Kisumu, Kenya.


PMID: 25946361

Abstract

We implemented a quality management system (QMS) and documented our improvements in a tuberculosis (TB) laboratory in Kisumu, Kenya. After implementation of the QMS, a sustained reduction in culture contamination rates for solid (from 15.4% to 5.3%) and liquid media (from 15.2% to 9.3%) was observed, and waste from product expiry was reduced significantly. External quality assurance (EQA) results were satisfactory before and after QMS implementation, and a client survey after implementation revealed 98% satisfaction. The laboratory attained ISO 15189 accreditation in October 2013. The implementation of QMS facilitated the attainment of target quality indicators, reduced waste due to expiry and led to high client satisfaction.

Risk factors for excess mortality and death in adults with tuberculosis in Western Kenya.
van't Hoog AH, Williamson J, Sewe M, Mboya P, Odeny LO, Agaya JA, Amolloh M, Borgdorff MW, Laserson KF.


PMID: 23131264

Abstract

OBJECTIVES:

To evaluate excess mortality and risk factors for death during anti-tuberculosis treatment in Western Kenya.

METHODS:

We abstracted surveillance data and compared mortality rates during anti-tuberculosis treatment with all-cause mortality from a health and demographic surveillance population to obtain standardized mortality ratios (SMRs). Risk factors for excess mortality were obtained using a relative survival model, and for death during treatment using a proportional hazards regression model.

RESULTS:

The crude mortality rate during anti-tuberculosis treatment was 18.0 (95%CI 16.8-19.2) per 100 person-years. The age and sex SMR was 8.8 (95%CI 8.2-9.4). Excess mortality was greater in human immunodeficiency virus (HIV) positive TB patients (excess hazard ratio [eHR] 2.1, 95%CI 1.5-3.1), and lower in patients who were female or started treatment in a later year. Mortality was high in patients with unknown HIV status (HR 2.9, 95%CI 2.2-3.8) or, if HIV-positive, not on antiretroviral treatment (ART; HR 3.3, 95%CI 2.5-4.5) or not known to be on ART (HR 2.8, 95%CI 2.1-3.7). The attributable fraction of incomplete uptake of HIV testing and ART on mortality was 31% (95%CI 15-45) compared to HIV-positive patients on ART.

CONCLUSION:

Increasing the uptake of HIV testing and ART would further reduce mortality during anti-tuberculosis treatment by an estimated 31%

Granich R, Muraguri N, Doyen A, Garg N, Williams BG.


PMID: 22611485

Abstract

In 2009, Government of Kenya with key stakeholders implemented an integrated multi-disease prevention campaign for water-borne diseases, malaria and HIV in Kisii District, Nyanza Province. The three day campaign, targeting 5000 people, included testing and counseling (HTC), condoms, long-lasting insecticide-treated bednets, and water filters. People with HIV were offered on-site CD4 cell counts, condoms, co-trimoxazole, and HIV clinic referral. We analysed the CD4 distributions from a district hospital cohort, campaign participants and from the 2007 Kenya Aids Indicator Survey (KAIS). Of the 5198 individuals participating in the campaign, all received HTC, 329 (6.3%) tested positive, and 255 (5%) were newly diagnosed (median CD4 cell count 536 cells/μL). The hospital cohort and KAIS results included 1,284 initial CD4 counts (median 348/L) and 306 initial CD4 counts (median 550/μL), respectively (campaign and KAIS CD4 distributions P = 0.346; hospital cohort distribution was lower P < 0.001 and P < 0.001). A Nyanza Province campaign strategy including ART <350 CD4 cell count could avert approximately 35,000 HIV infections and 1,240 TB cases annually. Community-based integrated public health campaigns could be a potential solution to reach universal access and Millennium Development Goals.


Cavanaugh J, Genga K, Marigu I, Laserson K, Ackers M, Cain K.


PMID: 22144009
Abstract

We collected clinical register data on children in two provinces of Kenya and conducted bivariate and multivariate analyses to assess characteristics associated with death. Among 987 children with tuberculosis (TB), pulmonary disease was diagnosed in 689 (70%) children. Final outcomes were known for 830 children, 40 (5%) of whom died during TB treatment. HIV test results were available for 670 (68%) children; 371 (55%) of whom tested positive. Only 63 of 134 (47%) of children <1 year were tested for HIV. There were no data on CD4 or anti-retroviral use. The relative risk for death for HIV-infected children compared to HIV-uninfected children was 9.3 for children <1 year [95% confidence interval (CI) 1.2-69.2], 3.9 for children aged 1-4 (95% CI 0.9-17.7) and 0.9 for children aged 5-14 (95% CI 0.3-2.6). In Kenya, HIV infection in children with TB is common, and our data suggest that HIV is particularly deadly in TB patients <1 year, the group with the lowest rate of testing. Poor data recording and reporting limit our understanding of TB in this age group. Expansion of HIV testing may improve survival, and more complete data recording and reporting will enhance our understanding of pediatric TB.

**High prevalence of pulmonary tuberculosis and inadequate case finding in rural western Kenya.**

van't Hoog AH, Laserson KF, Githui WA, Meme HK, Agaya JA, Odeny LO, Muchiri BG, Marston BJ, Decoct KM, Bergdorf MW.


PMID: 21239690

**Abstract**

**RATIONALE:**

Limited information exists on the prevalence of tuberculosis and adequacy of case finding in African populations with high rates of HIV.

**OBJECTIVES:**
To estimate the prevalence of bacteriological confirmed pulmonary tuberculosis (PTB) and the fraction attributable to HIV, and to evaluate case detection.

METHODS:

Residents aged 15 years and older, from 40 randomly sampled clusters, provided two sputum samples for microscopy; those with chest radiograph abnormalities or symptoms suggestive of PTB provided one additional sputum sample for culture.

MEASUREMENTS AND MAIN RESULTS:

PTB was defined by a culture positive for Mycobacterium tuberculosis or two positive smears. Persons with PTB were offered HIV testing and interviewed on care-seeking behavior. We estimated the population-attributable fraction of HIV on prevalent and notified PTB, the patient diagnostic rate, and case detection rate using provincial TB notification data. Among 20,566 participants, 123 had PTB. TB prevalence was 6.0/1,000 (95% confidence interval, 4.6-7.4) for all PTB and 2.5/1,000 (1.6-3.4) for smear-positive PTB. Of 101 prevalent TB cases tested, 52 (51%) were HIV infected, and 58 (64%) of 91 cases who were not on treatment and were interviewed had not sought care. Forty-eight percent of prevalent and 65% of notified PTB cases were attributable to HIV. For smear-positive and smear-negative PTB combined, the patient diagnostic rate was 1.4 cases detected per person-year among HIV-infected persons having PTB and 0.6 for those who were HIV uninfected, corresponding to case detection rates of 56 and 65%, respectively.

CONCLUSIONS:

Undiagnosed PTB is common in this community. TB case finding needs improvement, for instance through intensified case finding with mobile smear microscopy services, rigorous HIV testing, and improved diagnosis of smear-negative TB.


Centers for Disease Control and Prevention (CDC).


PMID: 21102405

Abstract

In resource-limited settings, high case-fatality rates are seen among tuberculosis (TB) patients with human immunodeficiency virus (HIV) infection, especially during the early months of TB treatment. HIV prevalence among TB patients has been estimated to be as high as 80%--90% in some areas of sub-Saharan Africa. In 2004, the World Health Organization (WHO)
recommended increasing collaboration between HIV and TB programs. Since then, many countries, including Kenya, have worked to increase TB/HIV collaborative activities. In 2005, the Kenya Division of Leprosy, Tuberculosis, and Lung Disease (DLTLD) added questions regarding HIV testing and treatment to the existing TB surveillance system.* This report summarizes HIV data collected from Kenya's extended TB surveillance system during 2006–2009. During this period, HIV testing among TB patients increased from 60% in 2006 to 88% in 2009, and the prevalence of HIV infection among TB patients tested decreased from 52% to 44%. In 2009, 92% of HIV-infected TB patients received cotrimoxazole prophylaxis for the prevention of opportunistic infections. Although these data highlight the increase in HIV services provided to TB patients, only 34% of HIV-infected TB patients started antiretroviral therapy (ART) while being treated for TB. Innovative interventions are needed to increase HIV treatment among TB patients in Kenya, especially considering the 2009 WHO guidelines recommending that all HIV-infected TB patients be started on ART as soon as possible, regardless of CD4 count. Although these guidelines have not yet been implemented in Kenya, officials are working to identify methods of increasing access to ART for TB patients.

Modifiable factors associated with active pulmonary tuberculosis in a Kenyan prison.

Amwayi AS, Kikuvi GM, Muchiri EM.


PMID: 23057255

Abstract

OBJECTIVES:

To establish modifiable factors associated with active pulmonary tuberculosis (PTB) among prisoners.

DESIGN:

Retrospective matched case-control study.

SETTING:

Nakuru GK prison in Kenya.

SUBJECTS:

A total of 144 subjects (48 cases and 96 controls) were recruited into the study. Cases were adult prisoners who had at least two initial sputum specimens being Acid Fast Bacilli-positive (AFB+) on direct smear microscopy and hence recruited to PTB WHO DOTS Programme. Controls were adults with no chronic cough and not on PTB treatment six months prior to the study.
RESULTS:

Independent factors significantly associated with active PTB disease were: self reported HIV+ status (OR=11; 95% CI = 2.42-47.77), evidence of BCG vaccination (OR = 0.20; 95% CI = 0.05-0.60), contact with PTB case (OR = 7.0; 95% CI = 1.17-38.23), unemployment (OR = 9.0; 95% CI = 1.84-43.97) and sharing linen (OR = 4.32; 95% CI = 1.08-17.29).

CONCLUSIONS:

Modifiable factors associated with active PTB in Nakuru G.K prison are: HIV status, BCG vaccination, PTB case contact, poverty and poor personal hygiene. We recommend HIV counseling and testing of all PTB patients, screening for TB upon prison entry and TB contact investigation and improving personal hygiene of prisoners.

Knowledge of HIV status, sexual risk behaviors and contraceptive need among people living with HIV in Kenya and Malawi.


PMID: 19542867

Abstract

BACKGROUND:

Several studies support the need for effective interventions to reduce HIV transmission risk behaviors among people living with HIV/AIDS (PLWHAs).

DESIGN:


METHODS:

We analyzed demographic health survey data for awareness of HIV status and sexual behaviors of PLWHAs (Kenya: 412; Malawi: 664). The analysis was adjusted (weighted) for the design of the survey and the results are nationally representative.
**FINDINGS:**

Eighty-four percent of PLWHAs in Kenya and 86% in Malawi had sex in the past 12 months and in each country, 10% reported using condoms at last intercourse. Among sexually active PLWHAs, 86% in Kenya and 96% in Malawi reported their spouse or cohabiting partner as their most recent partner. In multivariate logistic regression models, married or cohabiting PLWHAs were significantly more likely to be sexually active and less likely to use condoms. Over 80% of PLWHAs were unaware of their HIV status. Of HIV-infected women, nearly three-quarters did not want more children either within the next 2 years or ever, but 32% in Kenya and 20% in Malawi were using contraception.

**INTERPRETATION:**

In 2003-2005, majority of PLWHAs in Kenya and Malawi were unaware of their HIV status and were sexually active, especially married or cohabiting PLWHAs. Of HIV-infected women not wanting more children, few used contraception. HIV testing should be expanded, prevention programs should target married or cohabiting couples and family planning services should be integrated with HIV services.

**Tuberculosis risk among staff of a large public hospital in Kenya.**


PMID: 18647456

**Abstract**

**SETTING:**

In sub-Saharan Africa, high rates of tuberculosis (TB) and human immunodeficiency virus (HIV) infection pose a serious threat for occupationally acquired TB among health care workers.

**OBJECTIVE:**

To identify factors associated with TB disease among staff of an 1800-bed hospital in Kenya.

**DESIGN:**

We calculated TB incidence among staff and conducted a case-control study where cases (n = 65) were staff diagnosed with TB and controls (n = 316) were randomly selected staff without recent TB.
**RESULTS:**

The annual incidence of TB from 2001 to 2005 ranged from 645 to 1115 per 100000 populations. Factors associated with TB disease were additional daily hours spent in rooms with patients (adjusted odds ratio [aOR] 1.3, 95%CI 1.2-1.5), working in areas where TB patients received care (aOR 2.1, 95%CI 1.1-4.2), HIV infection (aOR 29.1, 95%CI 5.1-167) and living in a slum (aOR 4.7, 95%CI 1.8-12.5) or hospital-provided low-income housing (aOR 2.6, 95%CI 1.2-5.6).

**CONCLUSION:**

Hospital exposures were associated with TB disease among staff at this hospital regardless of their job designation, even after controlling for living conditions, suggesting transmission from patients. Health care facilities should improve infection control practices, provide quality occupational health services and encourage staff testing for HIV infection to address the TB burden in hospital staff.

*Tuberculosis and oral Candida species surveillance in HIV infected individuals in Northern Kenya, and the implications on tuberculin skin test screening for DOPT-P.*


PMID: 16619704

Abstract

**OBJECTIVE:**

To determine the pattern of opportunistic infections such as TB and Candida species in HIV infected patients in Northern Kenya.

**DESIGN:**

Cross-sectional study.

**SETTING:**

Five health facilities in Moyale (n=224), Mandera (n=121) and Turkana Kakuma; (n=83), Lodging; (n=94) districts during different periods in 2003.
SUBJECTS:

Five hundred and fifty two patients.

RESULTS:

In total 94 (18%) patients were found to be HIV positive (Moyale=42, Mandera=13, Turkana; Kakuma=8, Lop ding=31). Only 65 of 94 HIV positive patients provided saliva samples. Of these, 11 (17%) were TB smear positive and 19 (29.2%) were colonized by oral Candida species. The Candida isolates were as follows; Co-infection of Candida species and TB (n=4), C. albicans only (n=12), C. tropicalis only (n=1), C. albicans and C. glabarata (n=1) and C. albicans, C. glabarata and C. tropicalis. Co-infection (n=1).

CONCLUSION:

The findings provide an important insight into the differences in mucosal susceptibility to bacteria (TB) infection and fungal (Candida species) colonization during HIV immunosuppressant, based on collected blood, sputum and saliva specimens. Further studies are needed to elucidate the comparative transmission dynamics and pathogenesis mechanisms of these opportunistic infections in different regions of Kenya. Such studies would improve the efficiency of directly observed preventive therapy programme (DOPT-P) whose implementation involves screening by tuberculin skin testing.
**Effective tuberculosis control and health sector reforms in Kenya: challenges of an increasing tuberculosis burden and opportunities through reform.**

Hanson C, Kibuga D.


PMID: 10907765

**Abstract**

During the period from 1980 to 1997, the annual number of new tuberculosis cases increased four-fold in Kenya, and had reached approximately 50,000 cases by 1998. During the same time period, the government per capita expenditure on health dropped from US$9.5 to US$3.5. Since 1983, Kenya has been decentralizing financial responsibility and decision-making power to the districts. In addition, the late 1980s saw the introduction of cost-sharing schemes for most health services, excluding tuberculosis (TB) treatment. In the midst of these changes, a dual epidemic of TB and HIV/AIDS emerged, and is presently over-burdening the traditional public health system. In response, the National Leprosy and Tuberculosis Control Programme (NLTP) is seeking a wider network of service providers and new approaches to the prevention and treatment of TB in the country. The history of health sector reform in Kenya is summarized and the role of the NLTP in these reforms assessed. Recent approaches taken by the NLTP to sustain effective TB control, which draw on the environment of a changing and flexible health system, are expressed. Participation of the NLTP in components of health sector reform, particularly decentralization, integration, financing through cost-sharing and public/private mix, are highlighted.