

# Impact of introducing human immunodeficiency virus testing, treatment and care in a tuberculosis clinic in rural Kenya

H. Huerga,\* H. Spillane,\* W. Guerrero,\* A. Odongo,† F. Varaine‡

\*Médécins Sans Frontières, Nairobi, †National Tuberculosis Programme, Homa Bay, Kenya; ‡Médécins Sans Frontières France, Paris, France

## SUMMARY

**SETTING:** In July 2005, Médecins Sans Frontières and the Ministry of Health, Kenya, implemented an integrated tuberculosis-human immunodeficiency virus (TB-HIV) programme in western Kenya.

**OBJECTIVE:** To evaluate the impact of an integrated TB-HIV programme on patient care and TB programme outcomes.

**DESIGN:** Retrospective evaluation of three time periods: before (January–June 2005), shortly after (January–June 2006) and medium term after (January–December 2007) the implementation of the integrated programme.

**RESULTS:** Respectively 79% and 91% of TB patients were HIV tested shortly and at medium term after service integration. The HIV-positive rate varied from 96% before the intervention to respectively 88% (305/347) and 74% (301/405) after. The estimated number of HIV-positive cases was respectively 303, 323 and 331 in the

three periods. The proportion of patients receiving cotrimoxazole prophylaxis increased significantly from 47% (142/303) to 94% (303/323) and 86% (285/331,  $P < 0.05$ ). Before the intervention, 87% (171/197) of the TB-HIV patients would have been missed when initiating antiretroviral treatment, compared to respectively 29% (60/210) and 36% (78/215) after the integration. The TB programme success rate increased from 56% (230/409) to 71% (319/447) in the third period ( $P < 0.05$ ); however, there was no significant decrease in the default rate: 20% to 22% ( $P = 0.66$ ) and 18% ( $P = 0.37$ ).

**CONCLUSION:** Integrated TB-HIV care has a very positive impact on the management of TB-HIV patients and on TB treatment outcomes.

**KEY WORDS:** tuberculosis; HIV; one-stop; integration; ART

KENYA has one of the highest tuberculosis (TB) burdens in the world, with an incidence of 353 new cases per 100 000 population in 2007.<sup>1</sup> The overall prevalence of human immunodeficiency virus (HIV) infection in the country has been estimated at 7.4%, but the geographical distribution is very heterogeneous, with the western region accounting for the highest prevalence in the country.<sup>2</sup> Homa Bay District is located in western Kenya, on the shores of Lake Victoria. The estimated HIV prevalence in adults is 24%.<sup>3</sup>

The need for collaboration between TB and HIV programmes is widely recognised.<sup>4</sup> In 2004, the World Health Organization (WHO) published guidelines to encourage and help the national programmes in the implementation of collaborative activities.<sup>5</sup> Prior to 2005, no significant collaboration was put into practice in Kenya.<sup>6</sup>

In July 2005, Médecins Sans Frontières (MSF), in collaboration with the Kenyan Ministry of Health (MOH), implemented an integrated TB-HIV management programme at the TB clinic of Homa Bay District Hospital. The objective of the study was to evaluate the short- and medium-term impact of this interven-

tion on HIV testing for TB patients, the management of HIV-positive TB patients needing antiretroviral treatment (ART) and TB programme outcomes.

## METHODS

### *Intervention*

The implementation of an integrated TB-HIV management programme at the TB clinic was achieved first by increasing human resources: three staff members (clinical officer, nurse and counsellor) were transferred from the HIV clinic to the TB clinic. After integration, HIV testing and counselling were provided at the TB clinic along with education on HIV prevention. All services linked to the HIV care of HIV-positive TB patients, such as CD4 monitoring, cotrimoxazole prophylaxis and ART initiation or continuation, were delivered from the TB clinic.

### *Population*

All new TB patients registered at the TB clinic in Homa Bay District Hospital were included in the study. To evaluate the impact of the intervention, the indicators

were calculated for the new patients registered in the programme during the three periods of time before (January–June 2005), shortly after (January–June 2006) and at medium term after (January–December 2007) the implementation of the integrated services.

#### Data collection

In this retrospective study, data were collected from the TB registers, HIV testing registers and the HIV clinic patient files. Data from the TB registers and relevant information from the HIV clinic patient files were input into an Excel® database (Microsoft® Office Excel 2003, Microsoft, Redmond, WA, USA).

#### Study end points

The end points for the analysis were the proportion of HIV tests performed on new TB patients, the proportion of HIV positivity among patients who underwent HIV testing, the estimated proportion of HIV-positive TB patients receiving cotrimoxazole prophylaxis, and the estimated proportion of patients receiving ART by the end of the TB treatment among those who required it.

Given that HIV testing was not performed systematically during the three study periods, the number of HIV-positive TB patients in the programme was estimated using the HIV prevalence among TB patients tested for HIV in 2007 in Homa Bay TB Clinic. It was also considered that 65% of HIV-positive TB patients were in need of ART.<sup>7</sup>

TB programme outcomes were analysed 1 year after initiating TB treatment over the three time periods. TB outcomes for patients according to HIV status and ART initiation were also analysed for patients registered in 2007.

TB treatment outcomes were defined according to WHO guidelines.<sup>8</sup> HIV testing was performed using two rapid tests in succession, Determine® HIV Rapid Test (Abbott Diagnostic Division, Hoofddorp, The Netherlands) and Uni-Gold® HIV Rapid Test (Trinity Biotech, Bray, Ireland). TB was diagnosed on the basis of clinical examinations, sputum smear microscopy and, in some cases, chest X-ray. HIV patients were initiated on ART following WHO guidelines.<sup>8</sup>

#### Statistical analysis

Proportion of baseline patient characteristics and treatment outcome ratios were calculated using Epi Info 6.0 (Centers for Disease Control and Prevention, Atlanta, Georgia, USA) for the three different periods. Simple proportions and trends were compared between the three periods using Pearson's  $\chi^2$  test. The difference was significant if *P* values were below 0.05.

Ethical approval was not required for this retrospective, record-based study.

## RESULTS

Respectively 409, 437 and 477 patients were registered in the TB clinic in the three periods of time ana-

**Table 1** HIV testing and HIV-positive rates in TB patients before, shortly after and at medium term after implementing one-stop TB-HIV comprehensive care, Homa Bay Hospital, Kenya

	Before ( <i>n</i> = 409) <i>n/N</i> (%)	Shortly after ( <i>n</i> = 437) <i>n</i> (%)	Medium term ( <i>n</i> = 447) <i>n</i> (%)	<i>P</i> value*
HIV testing rate	NA	347 (79)	405 (91)	<0.01
HIV-positive rate	49/51 (96)	305 (88)	301 (74)	<0.01

\* Comparison between the services shortly after and at medium term after integration.

HIV = human immunodeficiency virus; TB = tuberculosis; NA = not available.

lysed. The impact of the intervention on HIV testing is shown in Table 1.

The estimated proportions of HIV-positive TB patients put under cotrimoxazole prophylaxis and of HIV-positive TB patients requiring ART and who actually received it increased significantly over the three periods of time (Table 2). There was a slight decrease in the estimated proportions of patients put on cotrimoxazole and on ART between the second and third periods that was statistically significant (*P* = 0.005) for cotrimoxazole, but not for ART initiation (*P* = 0.18). We can estimate that respectively 162 (53%), 22 (7%) and 47 (14%) HIV-positive TB patients were missed when prescribing cotrimoxazole, and 172 (87%), 61 (29%) and 79 (37%) HIV-positive TB patients were missed when prescribing ART over the three periods of time.

The proportion of TB smear-negative patients remained stable throughout the study period, at 42% (171/409), 37% (160/437) and 40% (177/447); the proportion of extra-pulmonary patients increased slightly, but significantly, after the implementation of a one-stop service: 22% (89/409), 29% (125/437, *P* < 0.05), 30% (136/447, *P* < 0.05).

TB treatment outcomes before, shortly after and at medium term after the intervention are shown in Table 3. There was a significant increased trend in the success rate and decrease in the death rate after the implementation of the one-stop service.

TB treatment outcomes according to HIV status

**Table 2** Cotrimoxazole prophylaxis and ART before, shortly after and at medium term after intervention in the TB Clinic at Homa Bay Hospital, Kenya

	Before <i>n</i> (%)	Shortly after <i>n</i> (%)	Medium term <i>n</i> (%)	Trend <i>P</i> value
HIV+ cases	304	325	332	
HIV+ patients under cotrimoxazole prophylaxis*	142 (47)	303 (93)	285 (86)	<0.01
Patients requiring ART receiving ART†	26 (9)	150 (46)	137 (41)	<0.01

\* Patients receiving cotrimoxazole prophylaxis/estimated number of HIV+ patients

† Patients under ART/estimated number of TB patients requiring ART.

ART = antiretroviral treatment; TB = tuberculosis; HIV = human immunodeficiency virus.

**Table 3** TB programme outcomes before, shortly after and at medium term after implementing a one-stop TB-HIV service in the TB clinic in Homa Bay Hospital, Kenya

	Before (n = 409) n (%)	Shortly after (n = 437) n (%)	Medium term (n = 447) n (%)	Trend P value
Success rate	230 (56)	254 (58)	319 (71)	<0.01
Death rate	31 (8)	45 (10)	15 (3)	<0.01
Failure rate	0	5 (1)	6 (1)	0.15
Default rate	82 (20)	93 (21)	79 (18)	0.48
Transfer rate	66 (16)	40 (9)	28 (6)	<0.001

TB = tuberculosis; HIV = human immunodeficiency virus.

and ART initiation are shown in Table 4. There was no difference between the outcomes of HIV-positive patients on ART and those of HIV-negative patients. The outcomes of the HIV-positive patients not on ART and those with unknown HIV status were considerably worse than for the HIV-negative patients.

## DISCUSSION

The impact of implementing a one-stop service in Homa Bay on HIV testing rates and patient management has been very positive. Significant scale-up was observed nationwide in HIV testing rates of TB patients, from 32% tested immediately after the introduction of a revised TB case recording and reporting system in 2005, to 59% 1 year later.<sup>6</sup> In a non-integrated TB setting in South Africa, only 26% of the TB patients knew their status;<sup>9</sup> where TB and HIV services are integrated, this proportion reaches 87% in Rwanda<sup>10</sup> and 91% in Malawi.<sup>11</sup>

Having access to onsite HIV testing in the TB clinic has clear benefits for TB patients from high HIV prevalence areas such as Homa Bay, where three of four TB patients are HIV-positive. As is the case with other TB programmes,<sup>12</sup> HIV testing was only offered to those suspected of HIV before the integration of services in Homa Bay. A decrease in the HIV-positive rate among tested patients over time has therefore been observed. A limitation of this analysis was the fact that the TB registers did not collect HIV information before June 2005.

The benefits of cotrimoxazole treatment in HIV-positive TB patients are well established in Africa.<sup>13</sup> Care for HIV-positive TB patients in Homa Bay clearly improved, with considerable increases in the number of patients receiving cotrimoxazole prophylaxis and ART. Due to the low rate of HIV diagnosis before the intervention, the analysis was not able to compare the exact proportions of HIV-positive patients receiving cotrimoxazole or ART before and after the intervention, but it seems that for a considerable number of TB patients, the opportunity of starting cotrimoxazole and ART during TB treatment was missed during that period. Nevertheless, after introducing HIV care in the TB clinic, the proportions of HIV-positive TB patients receiving cotrimoxazole and ART were higher than those reported at a national level in Kenya.<sup>6</sup> In Zambia, Harris et al. observed an increase of 38% in ART programme TB-HIV enrollees after integration of the TB and HIV programmes.<sup>14</sup> Considering that the number of patients with unknown HIV status halved between the second and third period of time, it is surprising to find that the proportion of patients on cotrimoxazole and ART did not increase during this period.

A drop in the number of hospital admissions in the TB programme was observed in 2007. The number of TB patients enrolled has remained stable since then. Reasons for such a decrease may relate to the opening of new TB centres and the increased access to ART in the area.

In addition to the expected positive impact on the provision of HIV testing and care, there was an improvement in the TB programme outcomes at medium term. As MSF support for the TB programme had started long before integration, the collaboration between the HIV and TB programmes was probably the main influence on these results.<sup>15</sup> The increased knowledge of new staff members regarding TB-HIV co-infection, as well as the experience of both counselling and drug dispensing brought from the HIV clinic into the TB programme, benefited all TB patients, and not only those who were HIV-positive. The increase in the proportion of extra-pulmonary cases over time is likely a result of increased awareness about

**Table 4** TB programme outcomes according to HIV status and ART initiation of patients registered in the TB clinic in 2007, Homa Bay Hospital, Kenya

	HIV- (n = 104) n (%)	HIV+/ART+ (n = 137) n (%)	P1 value*	HIV+/ART- (n = 164) n (%)	P2 value†	HIV unknown (n = 42) n (%)	P3 value‡
Success rate	85 (82)	104 (76)	0.27	108 (66)	<0.01	22 (52)	<0.01
Death rate	0	2 (1)	0.60	9 (5)	0.04	4 (10)	<0.01
Failure rate	1 (1)	3 (2)	0.81	2 (1)	0.69	0	0.64
Default rate	14 (13)	22 (16)	0.58	30 (18)	0.29	13 (31)	0.01
Transfer rate	4 (4)	6 (4)	0.90	15 (9)	0.16	3 (7)	0.68

\* HIV+ patients on ART compared with HIV-negative patients.

† HIV+ patients not on ART compared with HIV-negative patients.

‡ Patients with HIV status unknown compared with HIV-negative patients.

HIV = human immunodeficiency virus; TB = tuberculosis; ART = antiretroviral treatment.

this presentation of TB from the clinicians working in the TB clinic. Contrary to what has been observed in other programmes,<sup>16</sup> there was no improvement in the default rate after the introduction of HIV care in the TB clinic, although adherence counselling for TB treatment had been reinforced. Some of the patients recorded as defaulters in the second and third period may have been transferred to other TB centres.

Other impacts observed after the intervention were improved infection control, secondary to a reduction in contact between infectious TB patients and immune-compromised HIV patients in the HIV clinic; an improvement in the filing system, with the use of patient files for HIV-positive TB patients that were kept in the chest clinic during TB treatment and sent to the HIV clinic at the end of the TB treatment; and an improvement in the recording system, with better recording of HIV testing results and outcomes in the TB register.

The TB treatment outcomes for HIV-positive patients were not significantly different from those of HIV-negative patients. However, better outcomes were observed in HIV-negative patients and HIV-positive patients initiated on ART in a timely fashion<sup>17,18</sup> when compared with HIV-positive patients not on ART or patients with unknown HIV status. In other settings, HIV-positive TB patients receiving ART had a risk of death that was six times lower.<sup>19</sup> Default rates did not change despite specific and intensive counselling for patients on ART. Reasons and risk factors for defaulters should be further investigated, and additional efforts to trace defaulter patients should be made. In Nigeria, defaulter rates were similar to those found in this study, and were not related to HIV status.<sup>20</sup> The poor outcomes observed in TB patients with unknown HIV status once more reinforce the necessity of HIV testing<sup>21</sup> to provide adequate care and ART to HIV-positive TB patients.

In conclusion, the introduction of HIV testing, treatment and care in a TB clinic in a resource-limited setting such as Homa Bay has had a positive impact on HIV detection among TB patients, on the patient management both in the short and medium term, and on TB programme success rate at medium term. However, the proportion of patients who defaulted did not improve. TB treatment outcomes for patients with unknown HIV status and for HIV-positive patients not initiated on ART were significantly worse than for HIV-negative patients.

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## R É S U M É

**CONTEXTE :** En juillet 2005, Médecins Sans Frontières et le Ministère de la Santé ont mis en route un programme TB-VIH (tuberculose-virus de l'immunodéficience humaine) intégré dans l'Ouest du Kenya.

**OBJECTIF :** Evaluer l'impact de ce programme sur les soins des patients et les résultats du programme TB.

**SCHEMA :** Evaluation rétrospective de trois périodes de temps : avant la mise en œuvre (janvier-juin 2005), peu après celle-ci (janvier-juin 2006) et à moyen terme après (janvier-décembre 2007).

**RÉSULTATS :** Après l'intégration des services, respectivement 79% et 91% des patients TB ont été testés pour le VIH. Le taux de positivité du VIH a varié de 96% avant l'intervention à respectivement 88% (305/347) et 74% (301/405) après celle-ci. Le nombre estimé de cas infectés par le VIH ont été respectivement de 303, 323 et 331

pendant les trois périodes considérées. La proportion de patients bénéficiant d'une prophylaxie au cotrimoxazole a augmenté d'une manière significative de 47% (142/303) à 94% (303/323) et 86% (285/331,  $P < 0,05$ ). Avant l'intervention, 87% (171/197) des patients TB-VIH n'auraient pas été détectés au moment de la mise en route du traitement antirétroviral par comparaison avec 29% (60/210) et 36% (78/215) après l'intégration. Le taux de succès du programme TB a augmenté de 56% (230/409) à 71% (319/447) pendant la troisième période de temps ( $P < 0,05$ ), alors qu'on ne notait pas de diminution significative du taux d'abandon : 20% vers 22% ( $P = 0,66$ ) et 18% ( $P = 0,37$ ).

**CONCLUSION :** Les soins intégrés TB-VIH ont un impact très positif sur la prise en charge des patients TB-VIH et sur les résultats du traitement de la TB.

## R E S U M E N

**MARCO DE REFERENCIA:** En julio del 2005, Médecins Sans Frontières y el Ministerio de salud introdujeron el programa integrado TB-HIV (tuberculosis y virus de la inmunodeficiencia humana) en Kenya occidental.

**OBJETIVO:** Evaluar la repercusión del nuevo programa en la atención de los pacientes y en los resultados del programa.

**MÉTODOS:** Evaluación retrospectiva de tres períodos: antes de la introducción del programa (de enero a junio del 2005), un corto tiempo después (de enero a junio del 2006) y un mediano tiempo después de la introducción (de enero a diciembre del 2007).

**RESULTADOS:** La prueba del VIH se practicó en 79% de los pacientes tuberculosos que se inscribieron un corto tiempo después de la introducción del programa y en 91% de los inscritos un mediano tiempo después. La tasa de positividad de la prueba del VIH osciló entre 96% antes de la intervención y respectivamente 88% (305 de 347) y 74% (301/405) después. El número calculado de casos positivos al VIH fue 303 antes de la in-

troducción de programa integrado y 323 y 331 después. La proporción de pacientes que recibieron profilaxis con cotrimoxazol aumentó significativamente de 47% (142/303) a 94% (303/323) y hasta 86% (285/331;  $P < 0,05$ ). Se calculó que antes de la intervención, se habría pasado por alto 87% (171/197) de los pacientes con el VIH que estaban coinfectados por TB en el momento de iniciar el tratamiento antirretrovírico, en comparación con 29% (60/210) y 36% (78/215) después de la integración del programa. La tasa de éxito del programa anti-tuberculoso aumentó de 56% (230/409) a 71% (319/447) en el tercer período de análisis ( $P < 0,05$ ); sin embargo, no hubo una disminución significativa en la tasa de abandonos: 20% a 22% ( $P = 0,66$ ) y 18% ( $P = 0,37$ ). **CONCLUSIÓN:** La atención integrada de la TB y la infección por el VIH tiene consecuencias muy positivas en el manejo de los pacientes que padecen simultáneamente estas enfermedades y en los resultados del tratamiento antituberculoso.