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## Factors associated with loss to follow-up in Tuberculosis treatment in the Huambo Province, Angola

*Dear Editor,*

Loss to follow-up during treatment is considered one of the obstacles in the fight against tuberculosis (TB).[1] Angola is among the top thirty countries in the world ranked by TB burden with a TB treatment coverage of 51% and a success rate of 27% for new cases and 28% for previously treated cases.[2]

The health network of Huambo province, in addition to hospitals, centres and health posts, includes a sanatorium hospital, eleven outpatient clinics and an Anti-Tuberculosis Dispensary (ATD) – responsible for the TB outpatient management.

With the aim of identifying the factors related to loss to follow-up in TB treatment in the population of Huambo we designed a prospective and retrospective study in patients followed in the ATD with a TB diagnosis between October 2015 and January 2016 ($n = 353$).

The data collection was performed using a questionnaire developed for this study and filled out at monthly follow-up consultations by nursing technicians and researchers in the TB field, after receiving specific training. Patients were individually questioned in a closed environment on the ATD premises to maintain privacy, after clarification of the study and informed consent. End-of-treatment results were obtained from the clinical records of the patients in the end of August 2016. Loss to follow-up was considered for patients who started treatment but did not complete it.[3]

All statistical analysis was performed using R version 3.3.2. A univariate and multivariate logistic regression was performed with the response being loss to follow-up in TB treatment. For the multivariate analysis the complete model was determined starting with a selection of variables whose $p$-value was <0.10 in the univariate analysis, and using the stepwise regression method that minimizes the AIC (Akaike Information Criterion). The model discrimination ability was given by the area under the ROC curve. The significance level was set at 0.05.

The study was authorized by the General Directorate of the Sanitary Hospital of Huambo, Angola and approved by the Ethics Committee of the São João Hospital Center and the Faculty of Medicine of the University of Porto, Portugal.

Of the 353 patients who started treatment, 309 were included in the analysis, with no age limitation, both genders, new cases as well pre-treated cases. The 44 patients excluded from the analysis consisted of 42 who did not have

**Table 1** Sociodemographic and clinical characteristics associated with the l oss to follow -up in TB treatment in the Huambo Province.

| | Treatment Success | Lost to follow up | Univariate Analysis | | Multivariate Analysis | |
|---|---|---|---|---|---|---|
| | | | OR ( 95% IC) | p-value | OR ( 95% IC) | p-value |
| Patients n | 207 | 102 | | | | |
| *County* | | | | | | |
| Huambo | 175 (84.5) | 77 (75.5) | 1 | | 1 | |
| Outside of Huambo | 32 (15.5) | 25 (24.5) | 1.78 (0.98, 3.19) | 0.056 | 1.3 (0.99, 1,29) | 0.075 |
| *Sex* | | | | | | |
| Male | 130 (62.8) | 73 (71.6) | 1 | | | |
| Female | 77 (37.2) | 29 (28.4) | 0.67 (0.40, 1.11) | 0.128 | | |
| *Educational qualifications* | | | | | | |
| Illiterate | 24 (11.6) | 15 (14.7) | 1 | | | |
| Primary school | 61 (29.5) | 26 (25.5) | 0.68 (0.31, 1.52) | 0.343 | | |
| Secondary education (1C) | 55 (26.6) | 34 (33.3) | 0.99 (0.46, 2.17) | 0.978 | | |
| Secondary education (2C) or + | 67 (32.4) | 27 (26.5) | 0.64 (0.29, 1.43) | 0.273 | | |
| *Age* | | | | | | |
| 30 or + years | 100 (48.3) | 33 (32.4) | 1 | | 1 | |
| - than 30 years | 107 (51.7) | 69 (67.6) | 1.95 (1.20, 3.24) | 0.008* | 1.22 (1.09, 1.35) | 0.000* |
| *Employment* | | | | | | |
| Non regular occupation | 172 (83.1) | 83 (81.4) | 1 | | | |
| Regular occupation | 35 (16.9) | 19 (18.6) | 1.12 (0.60, 2.07) | 0.708 | | |
| *Consumption of alcoholic beverages* | | | | | | |
| Non-drinker | 123 (59.4) | 54 (52.9) | 1 | | | |
| Current drinker | 33 (15.9) | 26(25.5) | 1.79 (0.98, 3.29) | 0.058 | | |
| Ex-drinker | 51 (24.6) | 22 (21.6) | 0.98 (0.54, 1.77) | 0.954 | | |
| *Smoking tobacco* | | | | | | |
| Non-smoker | 173 (83.6) | 73 (71.6) | 1 | | 1 | |
| Current smoker | 16 (7.7) | 18 (17.6) | 2.67 (1.29, 5.57) | 0.008* | 1.31 (1.11, 1.55) | 0.002* |
| Ex smoker | 18 (8.7) | 11 (10.8) | 1.45 (0.63, 3.18) | 0.363 | 1.16 (0.97, 1.39) | 0.113 |
| *Serology* | | | | | | |
| Positive | 16 (7.7) | 10 (9.8) | 1 | | | |
| Negative | 191 (92.3) | 92 (90.2) | 0.77 (0.34, 1.82) | 0.538 | | |
| *Family Support* | | | | | | |
| Yes | 161 (77.8) | 66 (64.7) | 1 | | 1 | |
| No | 46 (22.2) | 36 (35.3) | 1.91 (1.13, 3.22) | 0.015* | 1.13 (1.01, 1.27) | 0.041* |

* $p < 0.05$.

a known result for the HIV test and 2 who were transferred to other units

Overall the patients included had a median age of 26 years old (IQR 21–37), 203 (65.7%) of whom were male, 255 (82.5%) had non-regular occupation, 177 (57.3%) did not consume alcoholic beverages, 246 (79.6%) did not smoke tobacco, 283 (91.6%) had negative HIV serology and 227 (73.5%) had family support during treatment (Table 1).

Among the included patients, being younger than 30 years old produced a 2.69-fold (95% CI 1.56–4.78, $p < 0.001$) increase in the risk of being lost to follow-up, smoking tobacco resulted in a 3.54-fold (95% CI 1.61–7.99, $p = 0.002$) higher risk. Not having family support and living outside Huambo city were both associated with an increased risk of loss to follow-up of 75% (95% CI 1.00–3.04, $p = 0.047$ and 95% CI 0.94–3.24, $p = 0.078$ respectively). The excluded patients differed from those included in the study as they had a higher proportion of people living outside Huambo city.

Our findings show that being younger than 30 was a risk factor for loss to follow-up. Besides that, our results do not differ much from studies conducted in South Africa[4] and Morocco where being older than 24 and being older than 50,[5] respectively, were considered protective factors for loss to follow-up. As for what life is like in Angola, we should take into account that the majority of the population is extremely young, since 65% are 24 years old or younger.[6] One possible explanation for this is the socioeconomic situation in Angola which often means the family is responsible for many young patients and also leads to a lack of access to transportation. In the present study, it was observed that patients without family support had a higher risk of loss to follow-up, and this was also observed in studies conducted in South Africa.[7] In Angola loss to follow-up exceeded 10%.[2] Based on our study, in order to increase adherence of TB patients to treatment, in addition to the DOTs some incentive measures should be adopted such as providing patient transportation and a basic food basket.

In this study there was a limitation that complete treatment cases were considered as successful even though these could not be classified as cured because there was no microbiological evidence at the end of treatment.

Based on the results, we conclude that age, lack of family support and smoking tobacco were associated with loss to follow-up in TB treatment in the Huambo province.

## Further reading


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