



Radiological screening of refugees in Germany

To the Editor:

In 2015, Germany registered 1 091 894 refugees. On arrival, refugees admitted to reception centres underwent statutory chest radiograph (CXR) screening for tuberculosis (TB), regardless of the country of origin. Notified TB cases increased by 29.4% from 4533 in 2014 to 5865 in 2015 [1]. We evaluated the yield of active TB screening using statutory CXR and the spectrum of TB disease diagnosed through mass screening.

Reports of CXRs of 38 001 refugees from 76 countries across four reception centres in Germany were obtained and reviewed (Bostedt, n=1584; Braunschweig, n=2390; Duderstadt, n=3799; Karlsruhe, n=30 228). The median age was 27.1 years (interquartile range 21.7–34.8 years); 25.8% were female. A quarter of the refugees were from Syria (25%) followed by Iraq (14%) and Afghanistan (11%). CXRs were suggestive of TB in 127 refugees. A detailed clinical record review revealed 37 individuals were lost to follow-up, TB was excluded in 38 and 52 were diagnosed with TB and treatment was initiated. Of those, 42 (81%) were microbiologically confirmed by culture and/or nucleic acid amplification, mirroring Dutch reports of 87% culture confirmation [2]. Overall TB prevalence was 140 per 100 000, similar to migrant screening in the Netherlands, with 119 TB diagnoses per 100 000 individuals screened [3]. TB prevalence was 0.05% (95% CI 0.02–0.10%), 0.09% (95% CI 0.04–0.17%), 0.23% (95% CI 0.08–0.49%) and 0.26% (95% CI 0.17–0.38%) in refugees from countries with TB incidences of <20, 20–50, 50–100 and >100 per 100 000, respectively (table 1) [4]. Prevalence was lowest among Syrian (31 per 100 000) and Iraqi (37 per 100 000) refugees, contradicting Belgian reports of prevalence rates of 94.2 per 100 000 among Syrians [5]. The highest rates were found among refugees from Somalia and Eritrea with prevalence rates that were 4–10 times higher than World Health Organization (WHO) incidence estimates [4].

By including CXR from four centres from different federal states we tried to obtain a representative sample of refugees arriving in Germany. German immigration statistics from 2015 and 2016 reported the following countries of origin for asylum seekers: Syria (37%), Iraq (14%), Afghanistan (11%), Pakistan (2%) and Eritrea (2%), a distribution similar to our dataset.

A third of individuals with a CXR suggestive of TB were lost to follow-up. Thus TB prevalence might be underestimated. The high numbers lost to follow-up highlight the challenges when screening highly mobile populations. Nevertheless, continuous medical supervision is essential since ALDRIDGE *et al.* [6] report high TB incidence rates among migrants from a high TB incidence country despite pre-entry screening. In their study, 80% of TB disease occurred after arrival. Thus, it is critical to ensure access to adequate TB services after initial screening.

In this study the number needed to screen to detect one individual with TB was more than 3000 among Syrians. In contrast, the number needed to screen among Somalis was only 94. In line with other studies, this suggests that mass screening of individuals from low-incidence countries such as Syria is inefficient, but screening among refugees from high incidence countries with long-lasting conflicts such as Somalia seems a worthwhile exercise [7, 8].

More data are required to identify the optimal TB incidence threshold balancing yield, efficiency and possible negative impact of missing individuals with prevalent TB. A screening algorithm based on WHO TB incidence estimates might be misleading as evidenced by the high prevalence of TB among Somalis, both in our study and in others [9]. The impact of mycobacterial transmission from refugees missed by screening is unknown. A recent meta-analysis concluded that current studies provide insufficient evidence to show that screening for active TB impacts on TB epidemiology [10]. Screening therefore mainly aims to



@ERSpublications

Radiological mass screening of migrants arriving in Germany from low-incidence countries may not be efficient <http://ow.ly/IFXJ309U5rA>

Cite this article as: Herzmann C, Golakov M, Malekzada F, *et al.* Radiological screening of refugees in Germany. *Eur Respir J* 2017; 49: 1602487 [<https://doi.org/10.1183/13993003.02487-2016>].

TABLE 1 Details of tuberculosis (TB) diagnoses obtained by mass chest radiograph (CXR) screening

Origin (WHO TB incidence rate per 100 000; 95% CI)	Screened refugees	Median (IQR) age years; females %	CXRs suspicious of TB; n (proportion; 95% CI)	TB rates per 100 000 (95% CI)
Afghanistan (189; 122–270)	4331 (11%)	23.8 (19.5–30.8); 24.9%	20 (0.46%; 0.28–0.71%)	139 (51–302)
Iraq (43; 38–49)	5403 (14%)	26.6 (22.1–34.2); 30.3%	14 (0.26%; 0.14–0.43%)	37 (4–134)
Pakistan (270; 175–386)	856 (2%)	28.1 (23.7–33.4); 4.8%	4 (0.47%; 0.12–1.2%)	234 (28–846)
Syria (20; 15–25)	9622 (25%)	28.2 (21.9–36.8); 27.8%	19 (0.20%; 0.12–0.31%)	31 (6–91)
Eritrea (65; 30–113)	937 (2%)	23.6 (20.5–27.8); 24.4%	9 (0.96%; 0.44–1.82%)	640 (235–1394)
Gambia (174; 131–223)	3281 (9%)	22.8 (19.8–27.1); 1.9%	16 (0.49%; 0.28–0.79%)	336 (168–600)
Nigeria (322; 189–488)	1030 (3%)	28.4 (23.5–33.4); 22.0%	3 (0.29%; 0.06–0.85%)	97 (2–542)
Somalia (274; 177–391)	375 (1%)	21.9 (18.8–27.1); 26.7%	7 (1.87%; 0.75–3.84%)	1075 (293–2753)
Russian federation (80; 69–92)	263 (0.7%)	32.2 (25.7–42.0); 46.8%	2 (0.76%; 0.09–2.74%)	0.00 (0.00–1413)
Non-EU Eastern Europe (15–42; NA)	6010 (16%)	31.0 (23.7–39.9); 39.6%	16 (0.27%; 0.15–0.43%)	166 (80–306)

WHO: World Health Organization; IQR: interquartile range; EU: European Union. Non-EU Eastern Europe countries include Albania (n=2382), Bosnia-Herzegovina (n=509), Macedonia (n=1311), Serbia (n=976), Montenegro (n=55) and Kosovo (n=777). A total of 5836 refugees were from other countries. TB prevalence among those refugees was 118/100 000 (95% CI 48–245). WHO TB incidence data were obtained from the WHO Global Tuberculosis Report [4].

modify individual morbidity and mortality. Screening, however, should not be a one-off event as individuals with abnormal CXRs have a significant risk of developing TB during follow-up [9]. These refugees should be monitored closely to diagnose active TB disease without delay. Close attention to new symptoms suggestive of incipient TB should be maintained in all structures caring for migrants, particularly in young migrants from high-incidence countries.

At present, a nationwide systematic follow-up system is lacking in Germany; ambulatory TB care is provided by more than 400 regional health authorities. Data protection regulations, limited IT interoperability and different registration systems challenge consistent follow-up of refugees.

Screening for latent TB infection (LTBI) and prophylactic treatment of LTBI in refugees might be considered for TB control among refugees. However, evidence on the effectiveness and cost-effectiveness of such a strategy for these populations is sparse [11]. Further prospective research is required to improve current algorithms and regulations that are often derived from regional statutory requirements without a scientific basis [12].

Christian Herzmann¹, Manja Golakov², Freschta Malekzade², Knut Lonnroth^{3,4} and Katharina Kranzer⁵

¹Research Center Borstel, Center for Clinical Studies, Borstel, Germany. ²University of Lübeck, Medical Faculty, Lübeck, Germany. ³Global TB Programme, World Health Organization, Geneva, Switzerland. ⁴Dept of Public Health Sciences, Karolinska Institutet, Stockholm, Sweden. ⁵Research Center Borstel, National Reference Center for Mycobacteria, Borstel, Germany.

Correspondence: Christian Herzmann, Research Center Borstel, Center for Clinical Studies, 23845 Borstel, Germany. E-mail: cherzm@fz-borstel.de

Received: Dec 19 2016 | Accepted after revision: Feb 01 2017

Support statement: Funding was granted by the Niedersächsischer Verein zur Bekämpfung der Tuberkulose. Funding information for this article has been deposited with the Crossref Funder Registry.

Conflict of interest: None declared.

Acknowledgements: We are grateful for their support and contributions to Udo Iseke and Janet Prior (both Duderstadt), Friederike Ley (Wiesbaden), Ulrich Wagner (Karlsruhe), Andreas Hinrichs, André Kröncke and Levke Sonntag (all Boostedt), Brigitte Buhr-Riehm and Iris Taddeo-Weiß (both Braunschweig), Doris Hellwig, Doris Thieme-Thörel, Eckart Mayr and Sabine Reinecke (Göttingen), and Thomas Wibmer and Reinhard Hoffmann (both Augsburg).

References

- 1 Robert-Koch-Institut. Welttuberkulose 2016: Gemeinsam gegen Tuberkulose. Berlin, Robert Koch-Institut, 2016. www.rki.de/DE/Content/Service/Presse/Teaser-Archiv/2016/14_2016_Teaser.html
- 2 Akkerman OW, de Lange WCM, Schölvinc EH, *et al.* Implementing tuberculosis entry screening for asylum seekers: the Groningen experience. *Eur Respir J* 2016; 48: 261–264.
- 3 Erkens C, Slump E, Kamphorst M, *et al.* Coverage and yield of entry and follow-up screening for tuberculosis among new immigrants. *Eur Respir J* 2008; 32: 153–161.
- 4 World Health Organization. Global Tuberculosis Report 2016. Geneva, WHO Press, 2016. Available from: <http://apps.who.int/iris/bitstream/10665/250441/1/9789241565394-eng.pdf>

- 5 Arrazola de Oñate W, Weber L, Janssens K, *et al.* Tuberculosis screening yield of asylum seekers in Europe. *Eur Respir J* 2016; 48: 1253–1254.
- 6 Aldridge RW, Zenner D, White PJ, *et al.* Tuberculosis in migrants moving from high-incidence to low-incidence countries: a population-based cohort study of 519 955 migrants screened before entry to England, Wales, and Northern Ireland. *Lancet* 2016; 388: 2510–2518.
- 7 Severi E, Maguire H, Ihekweazu C, *et al.* Outcomes analysis of new entrant screening for active tuberculosis in Heathrow and Gatwick airports, United Kingdom 2009/2010. *BMC Infect Dis* 2016; 16: 178.
- 8 Khan K, Hirji MM, Miniota J, *et al.* Domestic impact of tuberculosis screening among new immigrants to Ontario, Canada. *CMAJ* 2015; 187: E473–E481.
- 9 Harstad I, Jacobsen GW, Heldal E, *et al.* The role of entry screening in case finding of tuberculosis among asylum seekers in Norway. *BMC Public Health* 2010; 10: 670.
- 10 Kranzer K, Afnan-Holmes H, Tomlin K, *et al.* The benefits to communities and individuals of screening for active tuberculosis disease: a systematic review. *Int J Tuberc Lung Dis* 2013; 17: 432–446.
- 11 Zammarchi L, Casadei G, Strohmeyer M, *et al.* A scoping review of cost-effectiveness of screening and treatment for latent tuberculosis infection in migrants from high-incidence countries. *BMC Health Serv Res* 2015; 15: 412.
- 12 D'Ambrosio L, Centis R, Dara M, *et al.* European policies in the management of tuberculosis among migrants. *Int J Infect Dis* 2017; 56: 85–89.

Copyright ©ERS 2017