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Tuberculosis prevention, control and care in Greenland

Report of a review mission
5–10 June 2016

ABSTRACT

In June 2016, a WHO-led team of international, Danish and local experts assessed the achievements, strengths and weaknesses of the national tuberculosis (TB) programme and made recommendations for improving TB prevention, control and care. TB has been a major public health problem in Greenland for centuries. The number of cases fell until the late 1980s but rose again to a high of 234 incident TB cases and 19 deaths per 100 000 population in 2011. By 2015, these figures fell to 164 incidence and 13 deaths per 100 000 population and the estimated absolute number of incident TB cases was 92. The 81 new and relapse cases detected that year put the detection rate at 88%, close to the >90% WHO-recommended target for countries for TB.

Keywords

GREENLAND
NATIONAL HEALTH PROGRAMS
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TUBERCULOSIS

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Abbreviations

| | |
|------|--------------------------------|
| BCG | bacille Calmette-Guérin |
| IGRA | interferon-gamma release assay |
| MDR | multidrug-resistant |
| NTP | national B programme |
| PCR | polymerase chain reaction |
| RR | rifampicin-resistant |
| TB | tuberculosis |

EXECUTIVE SUMMARY

Greenland is an autonomous country within the Kingdom of Denmark. Greenland is the largest non-continental island in the world. Two thirds of the country is inside the Arctic Circle and without daylight for month. Less than 20% of the country is ice-free, mostly around the 44087 km coastline. In 2016, the population comprises in 56 thousand inhabitants of whom the majority are Inuit, the rest are Danish or other nationalities (figure 1).

The government is responsible for various areas of domestic policy, including Health.

Previous studies have shown that several socio-medical factors influence the development of TB in Greenland. As in other countries, the risk for TB is much greater for people who are less well off. Those at greater risk include residents of small villages with no access to running water, baths or flushing toilets; the unemployed; and people who consume more than average amounts of tobacco and alcohol. There is also evidence of increasing spread in towns. Homelessness can make compliance with the long-term treatment of TB extremely difficult.

There have been a number of impact intervention and quality developments in TB prevention and care during 2010–2015. In 2010, MOH of Greenland undertook a countrywide review with the assistance and coordination of WHO. A midterm review of those recommendations and programme performance indicators took place in 2013. At the request of Greenland's Ministry of Health, a team of experts from the WHO Regional Office for Europe, the Danish Lung Association and Statens Serum Institute Denmark visited Greenland during 5–11 June 2016. The team evaluate the country's efforts to address the high number of TB cases. Joined by national experts, the team travelled to large and small communities across Greenland to meet TB doctors and nurses in hospitals and health centres, laboratory staff, municipalities, teachers, social services, patients and families, to assess the situation and advice on action to stop TB.

Sustained focus on TB, both politically and in the population, is an essential component of strategies to tackle the disease. Other vital elements are early diagnosis; effective medical treatment, with supervision, monitoring and reporting based on internationally recommended indicators; complete, effective contact tracing and screening of risk-groups/environments; and in-service training and research for medical staff.

The team's findings provide feedback for the Government of Greenland's National TB Strategy 2012–2016.

During their travels, the team reported back regularly on their meetings and experiences, using #TBchat hashtag.ⁱ

A story of Ms Margit Weismann "One nurse's quest to track down TB on the eastern edge of Greenland", has been used raise public awareness to challenges that Greenland face and new technics in contacts tracing that provide wide opportunities to breakdown TB emergent situation in Greenland (Annex 3).

Objectives of the mission:

1. To visit TB health care facilities including laboratories and report on the quality of services;
2. To analyse epidemiological data, assess the accuracy of TB recording/reporting and monitoring system.
3. To develop a comprehensive set of recommendations and a prioritized action plan for improving TB prevention, control and care in the country of Greenland.

Areas of the review were:

1. Epidemiological impact analysis;
2. Government commitment, stewardship and policy;
3. Human resources development;
4. Surveillance and response monitoring;
5. Case detection and laboratory diagnosis;
6. Active case management and treatment;
7. Latent TB Infection management;
8. Inter-sectorial collaboration and TB care services in vulnerable populations and risk groups
9. Childhood TB management;
10. anti-TB medicines, vaccine, equipment and supplies management;
11. Infection Control;
12. Operational Research.

Main achievements

TB trends have systematically been monitored in Greenland since late 1950s.ⁱⁱ Since then, the TB incidence has decreased dramatically from 1 800 to 20 incident cases per 100 000 population between until 1984. After 1984, the TB incidence went on raise, and the number of incident tuberculosis (TB) cases in Greenland has continued increase for three decades. The last point in time with the highest incidence and mortality was in 2011, with 234 new and relapse cases, and 19 TB related death per 100 000 population, respectively. Since then, both incidence and mortality have decreased by 30% and 32%, respectively, and in 2015, they reached a level of 164 and 13 incidence and mortality rate per 100 00 population, respectively (Figure. 3). Since 2011, in contrast to the average in the WHO European Region, the decline in overall incidence in Greenland show a faster track of 6% vs 5% per year, respectively. Absolute number of incident TB cases estimated in Greenland in 2015 was 92 cases. Considering 81 new and relapse cases detected in Greenland during that year, the detection rate is at 88% which is close to >90% WHO recommended target for the countries for TB.

During the last ten years, the range of detected and notified new and relapse TB cases varied from 116 to 60 (2006 –2015), with a peak in 2010 and dip in 2007. In 2010, the raise was manly boosted by outbreaks occurring in East Greenland due to reactivation of decade-old infections among adults and ongoing transmission of infection in children (Figure 4).

These outbacks define the geographical distribution of TB notification in Greenland. In 2016, TB notification rate was from 21 on Ilulissat (west coast) to 787 in Ittoqqortoormiit (east coast). Two towns outstand with more than 10 detected TB cases, Nuuk and Tasillaq, however the notification rate in the last one exceeds almost three times the average in Greenland, 403 vs 145 new and relapse cases per 100 000 population, respectively.

Most of the cases were new, 91% (74), 88% of these (71) had a pulmonary localization, 76% (54) were bacteriologically conformed (Table 2).

TB emerged more often in male compared to women (ratio 3:2). In particular males above age 65, 15-24, and 55-64 years old are emerging with active TB ($p < 0.005$); 296, 288 and 283, respectively (table 3, figure 5).

Children represent 7% of the total TB cases in Greenland, which characterize an overall good performance of health system in healthcare among children in Greenland, nevertheless low ration of TB in 0-4 vs 5-14 indicates under-detection in 0-4 years old

Despite of the good surveillance performance last Rif Resistant (RR)-TB case was detected by the programme in 2014, means that estimative missing 2 RR-TB cases estimated among 11 TB cases that remain undetected in Greenland.

Out all 99 (100%) cases enrolled in treatment in 2014, 68% were successfully treated, which is worrying below of the 90% global target, because of a high failure and high “not evaluated” rate of 12% and 15%, respectively.

In efforts to combat TB, National Board of Health of Greenland:

1. In 1999, established the TB group for the coordination of local and national initiatives;
2. In 2007, developed National Strategy for the Combat of TB 2007–2012 and prioritizing extensive screening programmes in South Greenland every second year, and of school children at the start and finish of their schooling. TB nurses in South Greenland was appointed.
3. 2010, visit by TB expert from WHO followed by reports;ⁱⁱⁱ
4. 2011, Formulation of National TB Strategy 2012–2016;^{iv}
5. From 2012, ongoing information campaign to raise awareness, knowledge, attitude and practices though television, radio, internet, oral presentation and children books.
6. 2013, prioritising contact tracing and identifying vulnerable groups;
7. 2014, screening of school children at the start and finish of their schooling;^v

The National Tuberculosis Strategy Plan for Greenland 2012–2016 was developed based on the WHO report of a Country visit in 2010. The Strategy constituent parts was:

1. To guarantee sustained focus on TB–politically, socially and amongst the population
2. To guarantee early diagnosis–based on optimal taking of samples and diagnostic methods
3. To guarantee effective medical treatment
4. To guarantee complete and effective contact tracing
5. To guarantee effective treatment control, supervision and monitoring
6. To guarantee in- service training and to encourage research.

Key opportunities

Taking into account the recent developments in the health system of Greenland, the Review paid attention to development of recommendations for future actions, covering the following areas and topics:

8. Defining national TB control targets, milestones, objectives and priority interventions for inclusion in the national post–2015 strategic TB control plan 2017–2021;

9. Strengthening governance and management of the National TB Programme: options for organizational structure, functions, division of responsibilities, institutional arrangements at the central and regional level;
10. Revision of the diagnostic approaches and algorithms for TB and in the current set-up of TB service delivery, including regionalization of the laboratory service, coverage standards and implementation of new technologies;
11. Revision of treatment/case management strategies for MDR-TB based on the latest international evidence,

Main recommendations

Governance and stewardship

1. Implement the practice of systematically inter-sectorial collaboration at national level and in fields such as: (i) health care, social protection and education sectors; (ii) inclusion of the laboratory expertise into the [central TB coordination group], e.g. by the cooperation and inclusion of expertise from National/supranational reference laboratory (NRL/SRL) in Copenhagen.
2. Update the national action plan in line with global End TB strategy and TB Action Plan 2016–2020.
3. To continue working on developing and adoption of legislations by limiting alcohol consumption and stimulate healthy style of life.

HUMAN RESOURCES DEVELOPMENT

4. Building on the example of Health Aids, continue and strengthen horizontal (regional teams = local authorities, social services, industry, and health care system) and vertical collaboration (between national and regional team).
5. Engage more native staff by continuing building they expertize and delegate capacities (Regional TB nurses and coordinators).
6. Make the health staff in settlements aware about the national TB Action Plans.

TB CASE DETECTION AND LABORATORY

7. Strengthen/extend intensified case finding (ICF) by:
 - a. Continued systematic contact tracing activities: when a new pulmonary bacteriologically confirmed TB-cases, systematically look for those exposed for infection.
 - b. Identify risk groups for systematic targeted screening, such as: (i) household contacts, (ii) inmates, (iii) alcohol abusers (iv) dormitories inhabitants, and other locally identified risk groups and/or environments (use WHO tool for prioritizing the risk groups: refer to the WHO operational guideline for the systematic screening for active TB)^{vi}

8. Strengthen the diagnosis of TB in Greenland by improving The Diagnostic Algorithm for Pulmonary Tuberculosis:
 - a. Excluding systematic IGRA-testing for active TB;
 - b. Use only one of the initial three expectorates for GeneXpert PCR, prioritize the other two initial expectorates for culturing.
 - c. Alternatively, compare the yield of 2 cultures versus 2 PCR analysis in a “pilot study” (see details in report section 5 “Case detection and laboratory diagnosis”).
9. Roll-out of the PCR rapid diagnostics into 4 regional hospitals and Tasiilaq hospital in East Greenland dependent on the available staff capacity and capability.
10. Consider formalizing the agreement between Greenland and the WHO’s Supranational Reference Laboratory.
11. Establish pre-entry and yearly TB screening for prison.

TB and LTBI MANAGEMENT, INFECTION CONTROL

12. Enhance regular treatment follow-up by engaging resources to actively ensure TB treatment adherence, such as: family members, social workers.
13. Implement Latent TB infection treatment algorithm with 12 dosages of Isoniazid (INH)/Rifapentine.^{vii}
14. Provide BCG inoculation to children moving to Greenland and children staying more than three months in Greenland.
15. To consider installing upper room shielded (UVGI) in facilities patients are admitted.

SURVEILLANCE AND RESPONSE MONITORING

16. Establish a data exchange between the Greenlandic TB electronic register, the vital registration system, the laboratory data base at State Serum Institute, and the social care register to avoid data duplication and ensure data interoperability.
17. Add social determinants into TB register.
18. Establish a practice of field supervision for field performance evaluation and on-job mentorship (at list ones a year and ad-hoc basis when found necessary), and include impact, outcome and output indicators into the list of health care facility performance:
19. Assess social determinants on TB disease and treatment outcome and run a pilot on video-DOT.

Introduction

At the request of the National Board of Health in Greenland, a team of international, Danish and local experts selected by WHO and the Board carried out a review of the prevention, control and care of tuberculosis (TB) in Greenland from 5 to 10 June 2016. Members of the team assessed the achievements, strengths and weaknesses of the national TB programme (NTP) based on a review of relevant documents (publications, mission reports and databases) and site visits to appropriate institutions in selected municipalities.

Taking into account recent developments in the health system of Greenland, the team developed recommendations for action covering the following areas and topics:

- definition of national TB control targets, milestones, objectives and priority interventions for inclusion in the national post-2015 strategic TB control plan and support for these through the forthcoming application to the Global Fund (2015–2017);
- strengthening of governance and management of the NTP: options for organizational structure, functions, division of responsibilities and institutional arrangements at central and regional levels;
- revision of the diagnostic approaches and algorithms for TB and of the current system of TB service delivery, including regionalization of the laboratory service, standards for coverage and implementation of new technologies;
- revision of TB diagnostics and management of TB in children;
- revision of treatment/case management strategies for multidrug-resistant (MDR) TB based on the latest international evidence.

General information

Greenland is an autonomous administrative division within the kingdom of Denmark. The government is responsible for various areas of domestic policy, including health, which is financed by the national budget. Greenland is the largest non-continental island in the world: two thirds of it are inside the Arctic Circle and without daylight for about a month in mid-winter. Fishing is the primary industry. On 1 January 2016, the population comprised 56 000 inhabitants, the majority Inuit and the rest Danish or other nationalities (Fig. 1). Close to one third of the population lives in the capital, Nuuk, and the rest live in towns and small settlements along the coast which are not connected by roads: freight and passengers are transported by sea or air.

Epidemiological impact analysis

TB incidence, mortality and detection rate

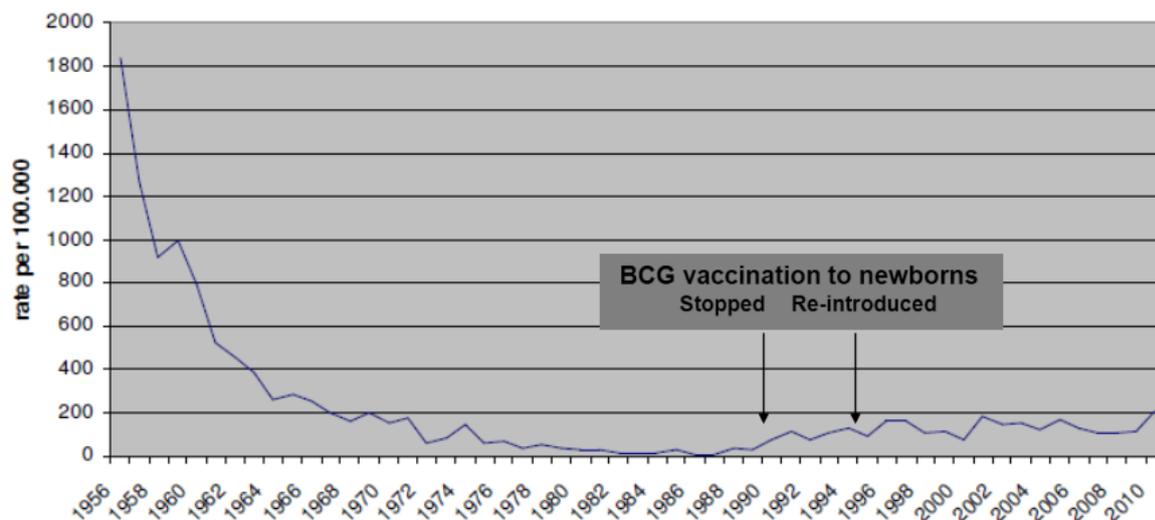
The trends in TB have been systematically monitored in Greenland since late 1956.^{viii} Between 1954 and 1984, TB incidence decreased dramatically from 1800 to 20 incident cases per 100 000 population (Fig. 2). After 1984, TB incidence rose again and, despite efforts by state

Fig. 1. Map of Greenland^{ix}



Source: Statistics Greenland.

Fig. 2. TB incidence rate per 100 000 population, Greenland, 1956–2012^x

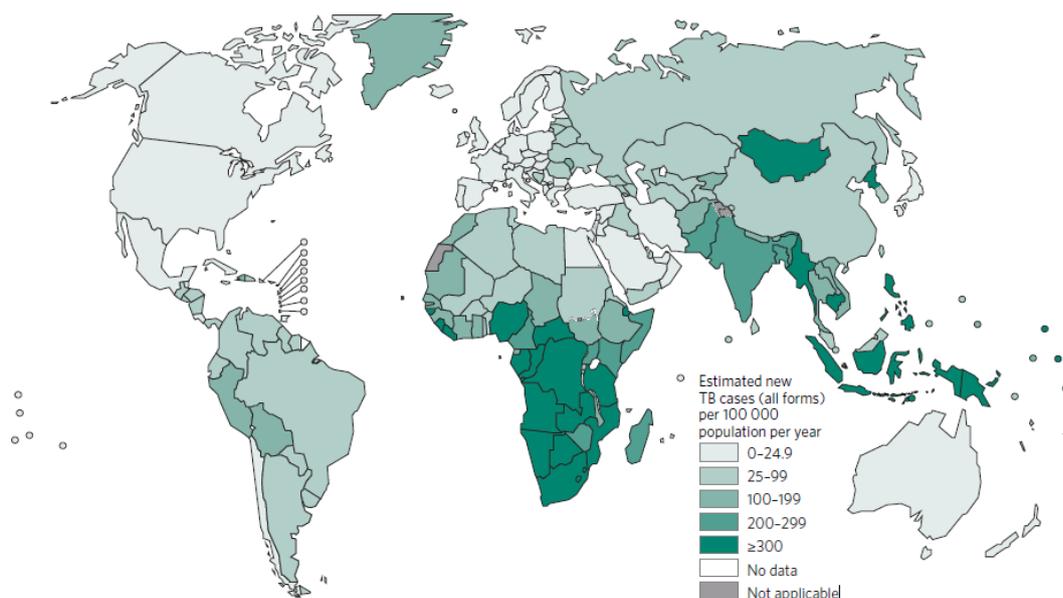


Source: Søborg B.

actors, the number of incident TB cases has continued to rise over three decades.^{xi} The highest incidence and mortality were in 2011, with 234 new and relapse cases and 19 TB-related deaths per 100 000 population, respectively. Since then, incidence has decreased by 30% and mortality by 32% so that in 2015 incidence was 164 (range 141–189) and mortality was 13 (range 8.4–20) per 100 00 population, respectively (Fig. 2).

The average rate for the 53 countries in the WHO European Region in 2015 was 30 cases per 100 000, and that for Denmark was 6 per 100 000. This makes Greenland the geographical area with the highest incidence in Europe (Fig. 3). In contrast to the regional average, however, in Greenland the decline in incidence since 2011 has been faster: 6% vs 5% average per year.^{xii}

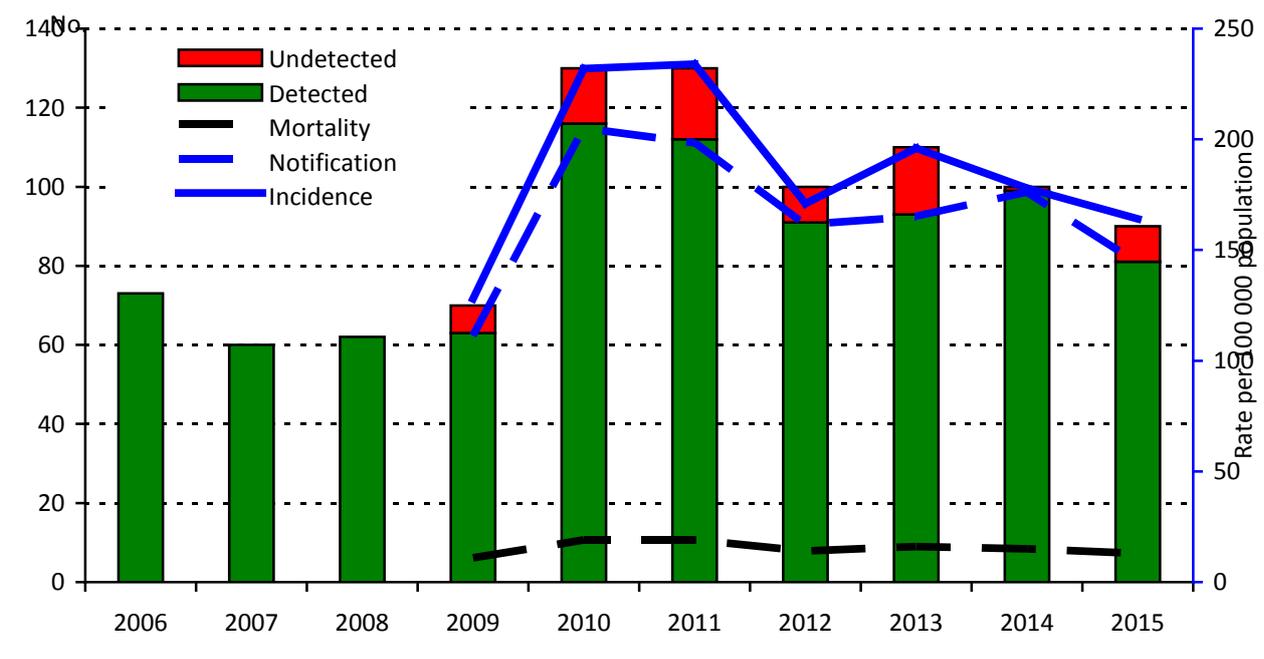
Fig. 3. Estimated TB incidence worldwide, 2015



Source: the WHO's Global tuberculosis report 2016. http://www.who.int/tb/publications/global_report/en/

Greenland joined the European TB surveillance network in 2009. Since then it has reported data annually to WHO via a standardized TB data collection web-based tool that includes notification, treatment outcome and other data. The absolute number of incident TB cases estimated in 2015 was 92 (range 79–110) cases. Taking into account the 81 new and relapsed cases detected in Greenland, the detection rate was 88% (range 75–100%), close to the >90% target recommended by WHO for Member States for TB (Fig. 4).

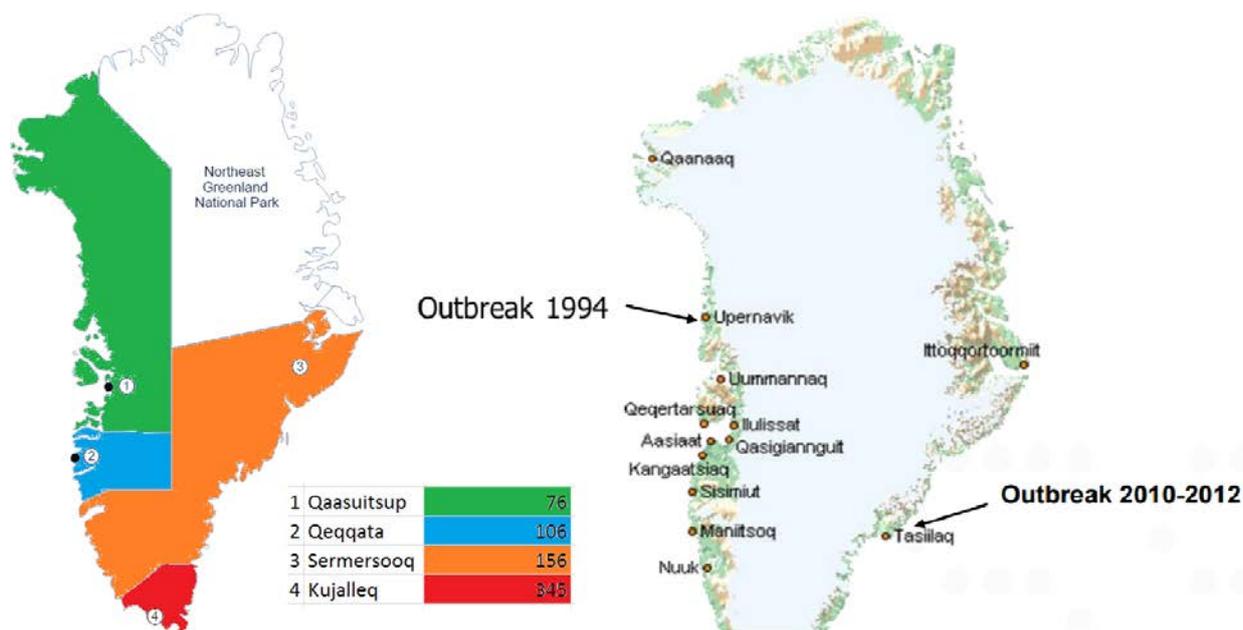
Fig. 4. Incident TB cases emerged and detected, Greenland, 2006–2015



TB notifications (trends, geo-spots, desegregation by disease localization, gender and age)

The range of detected and notified new and relapse TB cases varied from 116 to 60 from 2006 to 2015, with a peak in 2010 and a dip in 2007 (Fig. 4). The rise was mainly boosted by outbreaks occurring in east Greenland due to reactivation of a decade-old infection among adults and ongoing transmission of infection in children (Fig. 5).^{xiii,xiv} These outbreaks define the geographical distribution of TB notifications in Greenland (Table 1). TB notifications in 2015 ranged from 21 in Ilulissat on the west coast to 787 in Ittoqqortoormiit on the east coast. On the west coast, no TB was detected in the towns of Kangaatsiaq, Qaanaaq, Qasigiannuguit, Qeqertarsuaq and Uummannaq. More than 10 TB cases were detected in the towns of Nuuk and Tasiilaq, however, although the notification rate in Tasiilaq was almost three times the average in Greenland (403 vs 145 new and relapse cases per 100 000 population).

Fig. 5. TB notifications per capita in 2015 and map of outbreaks 1994–2012, Greenland



Source: <http://infektionspaediatrici.dk/wp-content/uploads/2012/01/TB-in-Greenland.pdf>

Table 1. TB notifications in Greenland per capita, 2015

| Municipality | Town/settlement | Population ^{aix} | TB cases ^{b xv} | TB notification rate/100 000 pop. |
|----------------------|------------------|---------------------------|--------------------------|-----------------------------------|
| Kujalleq | Nanortalik | 1 774 | 4 | 225 |
| | Narsaq | 1 679 | 9 | 536 |
| | Qaqortoq | 3 218 | 10 | 311 |
| | TOTAL | 6 671 | 23 | 345 |
| Qaasuitsup | Aasiaat | 3 275 | 6 | 183 |
| | Ilulissat | 4 803 | 1 | 21 |
| | Kangaatsiaq | 1 174 | 0 | 0 |
| | Qaanaaq | 761 | 0 | 0 |
| | Qasigiannuit | 1 193 | 0 | 0 |
| | Qeqertarsuaq | 866 | 0 | 0 |
| | Upernavik | 2 740 | 6 | 219 |
| | Uummannaq | 2 196 | 0 | 0 |
| TOTAL | 17 008 | 13 | 76 | |
| Qeqqata | Maniitsoq | 3 187 | 4 | 126 |
| | Sisimiut | 6 236 | 6 | 96 |
| | TOTAL | 9 423 | 10 | 106 |
| Sermersooq | Ittoqqortoormiit | 381 | 3 | 787 |
| | Nuuk | 17 588 | 14 | 80 |
| | Paamiut | 1 527 | 6 | 393 |
| | Tasiilaq | 2 977 | 12 | 403 |
| | TOTAL | 22 473 | 35 | 156 |
| Outside municipality | | 125 | | |
| TOTAL | | 55 700 | 81 | 145 |

Source: ^a Statistics Greenland; ^b National Board of Health.

Of 81 cases notified in 2015, 74 (91%) were new and 7 (9%) were relapses, 71 (88%) had a pulmonary localization of active TB and 54 (76%) of all new and relapses with a pulmonary localization of active TB (71) were bacteriologically confirmed (Table 2).

Table 2. TB case distribution by previous treatment history, disease localization and bacteriological confirmation, Greenland, 2015

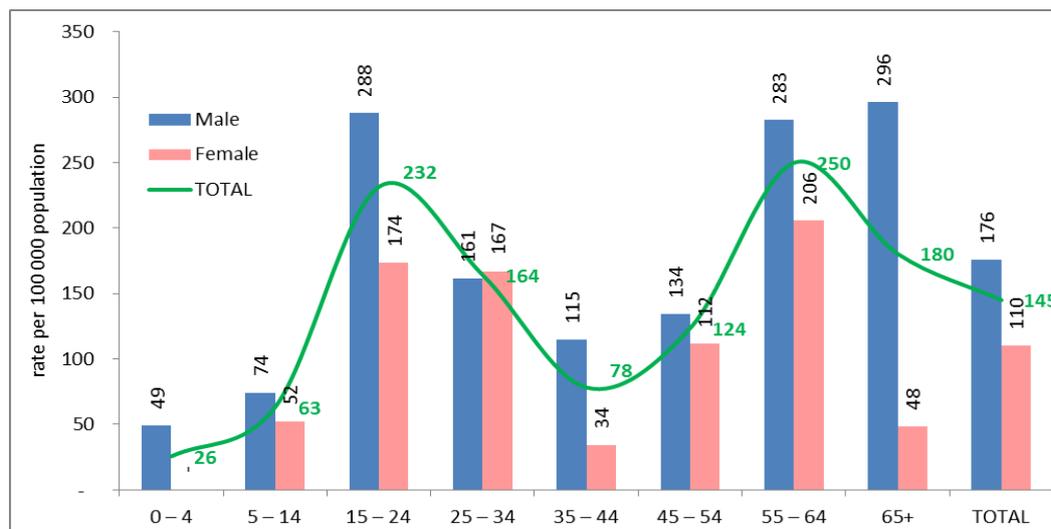
| | New | Relapse | Other previously treated patients | TOTAL |
|-------------------------------------------------|-----|---------|-----------------------------------|-------|
| Pulmonary TB cases, bacteriologically confirmed | 51 | 3 | | |
| Pulmonary TB cases, clinically diagnosed | 13 | 4 | 0 | |
| Extrapulmonary TB cases (all) | 10 | 0 | | |
| TOTAL | 74 | 7 | 0 | 81 |

TB has emerged more often in men than women (ratio 3:2), in old rather than young adults (250 and 232 cases per 100 000 population, respectively), and above all in males aged over 65 years, 15–24 years and 55–64 years ($p < 0.005$): 296, 288 and 283 cases per 100 000 population, respectively (Table 3, Fig. 6).

Table 3. TB notifications by gender and age, Greenland, 2015

| Age (years) | Cases | | | Population | | | Rate per 100 000 by age | | | % by age |
|-------------|-------|--------|-------|------------|--------|--------|-------------------------|--------|-------|----------|
| | Male | Female | TOTAL | Male | Female | TOTAL | Male | Female | TOTAL | |
| 0–4 | 1 | 0 | 1 | 2 036 | 1 854 | 3 890 | 49 | – | 26 | 17 |
| 5–14 | 3 | 2 | 5 | 4 042 | 3 850 | 7 892 | 74 | 52 | 63 | 83 |
| 0–14 | 4 | 2 | 6 | 6 078 | 5 704 | 11 782 | 66 | 35 | 51 | 7 |
| 15–24 | 12 | 7 | 19 | 4 169 | 4 034 | 8 203 | 288 | 174 | 232 | 23 |
| 25–34 | 7 | 7 | 14 | 4 339 | 4 189 | 8 528 | 161 | 167 | 164 | 17 |
| 35–44 | 4 | 1 | 5 | 3 480 | 2 908 | 6 388 | 115 | 34 | 78 | 6 |
| 45–54 | 7 | 5 | 12 | 5 224 | 4 483 | 9 707 | 134 | 112 | 124 | 15 |
| 55–64 | 11 | 6 | 17 | 3 890 | 2 912 | 6 802 | 283 | 206 | 250 | 21 |
| 65+ | 7 | 1 | 8 | 2 363 | 2 072 | 4 435 | 296 | 48 | 180 | 10 |
| TOTAL | 52 | 29 | 81 | 29 543 | 26 302 | 55 845 | 176 | 110 | 145 | |

Fig. 6. TB notifications by gender and age per 100 000 population, Greenland, 2015



Children become infected more easily than adults and are exposed to infection for only a limited time before diagnosis, whereas adults can carry the infection for a number of years without developing TB. The high number of infected children indicates the active spread of the disease.

Given the challenges of diagnosing and reporting childhood TB cases, the notification rate among children (51/100 000 children) is three times lower than the countrywide average (145/100 000 population).

The bacille Calmette-Guérin (BCG) vaccine was reintroduced in 1997 among all newborns in Greenland. This intervention has led to a decrease in active TB among children.^{xvi} In 2011, a cross-sectional survey showed a prevalence of TB infection in school-age children (6–16 years) of 8.4%, with an annual risk of about 1% of infection in Inuits. A strong clustering of infection among siblings, with a 14.2 times higher risk of them contracting the infection from a family member with active TB, indicates high transmission to children. Low maternal education and household crowding were the leading determinants associated with the transmission of TB infection among young Greenlanders.^{xvii}

In 2015, TB in children represented 7% of total TB cases, indicating that the health system has a good overall performance in health care for children (benchmark B 1.6: the percentage of children diagnosed with TB is 5–15% in low- and middle-income countries and <10% in high-income countries).^{xviii} Nevertheless, the low ratio of TB in children aged 0–4 years as compared with those aged 5–14 years (0.25 vs 1.5–3.0 of benchmark 2.3) indicates under-detection in children aged 0–4 years.

Drug-resistant TB

The incidence of rifampicin-resistant (RR) TB is estimated to be five (four to seven) cases, a proportion of 2.3% and 15% RR-TB among all incident TB cases, or two (range two to three) of the total number of estimated cases of RR-TB in 2015. A continuous surveillance system based on routine drug susceptibility testing established in Greenland met class A performance^{xix}, which provides a direct measure of drug resistance. Despite the good surveillance performance, one

RR-TB case was detected by the NTP in 2014, meaning that two missing MDR-TB cases could be among the 11 TB cases that emerged in Greenland and remain undetected.

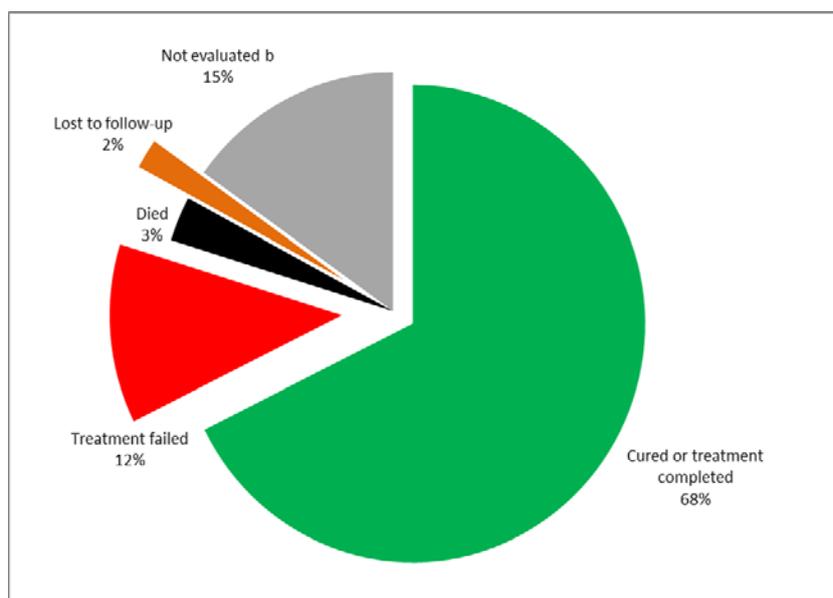
HIV/TB co-infection

No HIV was estimated in 2015 among emerging incident TB cases and none was detected among the individuals offered HIV testing. HIV testing is done when requested by a patient or by a physician in response to clinical signs or in the framework of HIV contact investigations. The most recent TB/HIV case was detected in 2014.

Treatment outcome monitoring

Treatment outcome monitoring data became available after an amendment to the TB recording and reporting tools in 2010.^{xx} Of the 99 (100%) cases enrolled in treatment in 2014, 68% were successfully treated, far below the global target of 90% (Fig. 7). Of serious concern are the high failure and not evaluated rates of 12% and 15%, respectively, which should be addressed by strengthening direct observation of treatment, using new models of care such as community involvement, incentives and enablers for treatment adherence and digital health elements (video directly observed therapy).

Fig. 7. Treatment outcomes among all new and relapse cases notified in 2014



Governance and stewardship

The government is strongly committed to TB prevention and control, as reflected by its request to WHO for a programme review, its high-level participation in the review, prioritization of funding and ensuring of TB services. The municipalities, education sector, prison services and maritime sector all interact. TB services are provided free to all citizens and are close to patients. TB and HIV posters have been developed and a book for children and other communication materials are available in the local language and Danish.

The National Board of Health is responsible for developing guidelines. An online training module: Tuberculosis Manual is available on <http://manualen.tb.gl/>. The manual is an integrated to the health system intranet interactive website in Danish and Greenlandic containing background information about the disease and its historical course, its diagnosis and treatment and contact-tracing (www.tuberkulose.gl). The website provides guidance on how to take and deal with samples and how to tackle problems. Leaflets and other material can be downloaded. The manual, which was initially used for a TB seminar for TB coordinators in March 2011, consolidates and supplements existing guidelines and information. It is aimed at all health workers, especially TB coordinators. Community involvement is limited and, in TB prevention and control, almost non-existent. In one of the schools visited the head teacher, who was not aware of the transmission mode of TB, did not think TB was a priority in the face of other social problems. The nurse at a municipality visited used to work as a TB nurse and was fully aware and engaged in the social welfare link to health.

Recommendations

The team made the following recommendations.

1. Internal and external partnerships should be continued.
2. The practice of systematic intersectoral collaboration at national level and in the field should be implemented, including: (i) the health care, social protection and education sectors, and (ii) laboratory expertise in the central TB coordination group and consideration of cooperation with and inclusion of expertise from the national reference laboratory.
3. The national action plan should be updated in line with the global End TB strategy and TB Action Plan 2016–2020.
4. Work should continue on legislation to limit alcohol consumption and stimulate healthy lifestyles.
5. The possibilities should be explored for engaging members of communities (such as former patients) in advocacy and social mobilization.

Human resources development

National and regional TB teams have been established with highly motivated staff, although there is a high turnover. Health aides are a good example of how to strengthen the capacity of the Inuit population. They represent a front line of health care delivery in the fields, acting in the health aids point in the settlements.

Recommendations

The team made the following recommendations.

1. Building on the example of health aides, collaboration horizontally (through regional teams including local authorities, social services, industry and the health care system) and vertically (between national and regional teams) should be continued and strengthened.
2. More Inuit staff should be engaged by further expertise-building and delegation of capacities to, for example, regional TB nurses and coordinators.

3. Webinars should be organized for staff, conducted jointly with WHO and/or other partners such as the State Serum Institute national reference laboratory in Copenhagen, the Danish Lung Association and the European Respiratory Society.
4. Health care staff in settlements should be informed about the national TB action plans.

TB case detection and laboratory

The purpose of active TB case detection is to identify all active TB cases as early as possible in the interests of both individuals and society. When a case is detected promptly, the individual can benefit from TB treatment which can stop the progression of the disease and potential complications and can lead to a successful outcome. Society can benefit from reduced active transmission and thus a reduction in the number of new TB cases.

The role of laboratories is to assist clinicians in the diagnostic process, usually by microscopy, polymerase chain reaction (PCR) of DNA and culture-based methods and, in some cases, by interferon-gamma release assay (IGRA). Ideally, the diagnostic method should be fast (microscopy and PCR) so as to find cases early, and sensitive (culture) so as to find all cases. The diagnostic method should also provide information on the exact species of BCG (*M. tuberculosis*, *M. bovis* or *M. bovis*) and it should be able to detect and distinguish TB from disease caused by non-tuberculous mycobacteria. The diagnostic methods used should also give information on susceptibility patterns to avoid incorrect treatment and transmission of resistant strains. Ideally, the methods should also reveal information on transmission patterns and identify potential laboratory cross-contamination. Finally, diagnostic procedures should always be assured using a quality management system (such as standard 15189 of the International Organisation for Standardization) or the recommendations in the WHO Guide for the Stepwise Laboratory Improvement Process towards Accreditation in the African Region.

Findings

The team observed the following achievements during their visit since the recommendations in the NTP review of 2010.

- A new PCR-based algorithm using GeneXpert technology has been implemented in Nuuk allowing faster PCR-based diagnostics in the capital region. The introduction of this automated PCR system protects the laboratory staff by reducing the hands-on workload.
- The diagnostic criteria for Greenland have been reviewed and published (most recently in April 2013) with the intention of making early diagnoses, ensuring the use of the most up-to-date methods and preventing misinterpretation by staff, especially at posts where there is a high turnover of personnel.
- The majority of PCR-positive TB cases are subsequently cultured allowing for DST, species identification/verification and genotyping.
- The Piplalik telemedicine technology has been installed in all hospitals and settlements with more than 50 inhabitants. This new technology, demonstrated during the review, seems to offer an excellent opportunity to get advice quickly on difficult cases, including diagnostic procedures and interpretation of results.

The team also observed the following challenges.

- The diagnostic algorithm for pulmonary tuberculosis (flow-chart) systematically includes IGRA for diagnosing active TB.^{xxi} IGRA does not, however, distinguish active TB from latent infection. In addition, the sensitivity of IGRA is only approximately 85%. In a TB high-incidence area such as Greenland, latent *M. tuberculosis* infection is frequent. Thus, a positive IGRA result does not really help to diagnose active TB. Conversely, a negative IGRA result cannot be used to exclude active TB given the relatively low sensitivity. Also, the most severe TB cases are sometimes IGRA-negative due to an impaired immune response.
- Depending on the IGRA (and X-ray) result, the diagnostic algorithm for pulmonary TB (flow-chart) systematically includes three samples of sputum at diagnosis for PCR analysis. The majority of PCR-positive TB cases are, however, detected in the first PCR, which is why the next two tests can be prioritized for culturing.
- Cultures which are more sensitive than PCR are not routinely included in the diagnostic algorithm for pulmonary tuberculosis.^{xxii} By not including cultures routinely in the initial diagnostic algorithm, early TB cases and other TB cases with less advanced disease can be missed. Thus, a “PCR-based-only” diagnostic algorithm can unintentionally result in TB cases found at a later stage of their disease with more severe complications for the individual and with a higher level of transmission to others.
- As mentioned above, GeneXpert PCR technology has been implemented in Nuuk allowing for fast PCR-based diagnostics in the capital region. This relatively easy to operate technology has not, however, been implemented or made accessible in the towns or outlying settlements. Thus, from most areas of Greenland, specimens still need to be collected, labelled, packed and shipped to Nuuk to be analysed. The team could not find statistics of the numbers of samples sent and responses received.
- The GeneXpert PCR technology implemented includes a genotypic test for RR (proxy for MDR-TB). However, as RR is nearly non-existent in Greenland, the positive predictive value of the test in this setting is low, so to avoid unnecessary, costly and potentially dangerous treatment of false positive MDR-TB cases, it is important that all PCR results are confirmed by culture. This also applies to the detection of other types of resistance, for example to isoniazid, which is more frequent in Greenland. If isoniazid resistance is overlooked, rifampicin will be given as monotherapy in the continuation phase of the treatment, which can create MDR-TB cases.
- Equipment for analysing blood (basic blood tests, especially liver enzymes) in Tasiilaq should be renewed. In the Kujutta area there is no possibility of having liver enzymes analysed within a day; this needs to change.
- The collaboration agreement between the Greenlandic government and the WHO supranational TB reference laboratory at the State Serum Institute in Copenhagen (which supports Greenland) has not yet been signed.

Recommendations

The team made the following recommendations.

1. Discontinue systematic IGRA testing for active TB.
2. Only one of the initial three expectorates for GeneXpert PCR should be used; the other two initial expectorates should be prioritized for culturing. Alternatively, the yield of two cultures versus two PCR analyses should be compared in a diagnostic pilot study. For

example, in the first half year, two cultures and one PCR should be done and in the next half year, one culture and two PCR should be done and the results compared. After that, the algorithm that identifies most cases (and most cases at an early disease stage) should be used.

3. PCR rapid diagnostics should be rolled out in the four regional hospitals and Tasiilaq hospital in East Greenland, taking into account the available staff capacity and capability. Consideration should be given to using the new GeneXpert equipment, particularly the mobile version (Omni or Ultra).
4. Consideration should be given to formalizing the agreement between Greenland and the WHO supranational TB reference laboratory.^{xxiii}

TB treatment and case management

Many doctors are in Greenland for short periods of time and have limited experience of clinical management of TB since they usually come from a low-incidence country such as Denmark, so it is often the TB nurse who reports the TB treatment outcome. The guidelines produced by the National Board of Health and revised in April 2013 describe how to treat active TB cases, how to conduct TB contact-tracing and how to manage latent TB treatment. Where cases are not complicated, treatment in hospital is normal during the first one or two weeks, followed by outpatient treatment under the care of the doctor and TB nurse/TB coordinator.^{xxiv}

At national level, the functions of ensuring overall TB care in Greenland and practical implementation of the national TB strategy are responsibility of the Agency for Health and Prevention, with a member of staff designated the TB consultant acting as NTP manager. He/she operates in close collaboration with the national TB nurse. The consultant is also responsible for managing the treatment of particularly complicated TB cases throughout Greenland, such as TB meningitis, TB of bones and joints and MDR-TB.

In the sites visited, patients were being put on appropriate treatment, including the correct dosage of medicine. At the time of visit, only two MDR-TB patients were undergoing treatment. The MDR-TB treatment regimen included moxifloxacin, ethionamide, pyrazinamide and myambutol. Case-holding is a challenge due to patients receiving up to one month of unsupervised treatment, with no peer support or community involvement. The health aide at the settlement or the TB nurse is responsible for directly observed therapy, which is rarely used because of cultural and geographical factors. Anti TB-drugs are often given on weekly basis.

Rapid screening (in less than 24 hours) for liver toxicity was not available at all the facilities.

Recommendations

The team made the following recommendations.

1. Regular follow-up should be enhanced among vulnerable patients and groups by engaging people such as family members or social workers to ensure patients' active adherence to TB treatment.
2. The possibility of screening for liver enzymes should be assured.

Latent TB infection

The purpose of a diagnosis of latent TB infection is to eliminate the risk of conversion to active TB which could threaten the health of the individual and risk transmission more widely. Detection of latent TB infection in a high-incidence country raises a number of questions, including with regard to treatment. The total number of cases in Greenland for latent TB infection was reported to be 80–100 per year in the period 2013–2015. The treatment used is isoniazid for six months. In Kulusuk, Kuummiut, Tasiilaq and Tiniteqilaaq the vast majority of patients (22/28) were aged between 5 and 14 years. In the same period alone in Tasiilaq there were 68 cases of TB (80% confirmed bacteriological).

Screenings of schoolchildren with quantiferon were carried out during the 2007–2008 and 2010–2011 academic years. A total of 3723 schoolchildren from the 2007–2008 academic year up to and including the 2009–2010 academic year (73% of the total) were screened. In 2009–2010, 14% of those in the 10th grade were positive.

Cases of latent TB infection have been found. Those treated according to the national protocol are close contacts and recent infection in individuals aged under 19 years that shows a quantiferon test positive results. Taking into account the high number of active cases among children and young people (0–15 years) and old people (aged >50 years), a high transmission rate should be estimated.

Recommendations

The team made the following recommendations.

1. Active case-finding should be intensified, both for finding latent infection and active disease. The focus should be on the contacts of an index patient.
2. Consideration should be given to embarking on 12 doses of rifapentine-isoniazid weekly preventive treatment.^{xxv}

Surveillance, response monitoring and operational research

The TB recording and reporting system is built in commercial software that is operating an SQL server and represented by a web-based central database with an external secured bridge for data interoperability. About 70 variables document the status of TB patients notified by the system in the following categories: time, place, gender, age, previous history, disease localization and treatment outcomes. Nevertheless, bacteriological test results, such as Xpert MTB/RIF test, culture, LPA and conventional DST remain unlinked. The database does not contain social determinants or risk factors.

The database is accessed by field doctors and its quality control and maintenance is provided by the national TB nurse. Online data visualization is limited, so the core epidemiological status and trends are based on the extracted linear database (cohort analysis). Content coverage of the core variables is complete and matches the field hospital registers that provide evidence with no under-notification. Nevertheless, under-detection is estimated at 12% (range 0–25%).^{xii} The database is under continuous development and is not linked with the electronic health records system or the vital registration system. The TB electronic register also records data on all

contacts screened and detected, including latent TB infection, as well as their treatment outcomes.

In late 2015, the central TB team established a group of field focal points/coordinators who, in a national monitoring and evaluation framework supervise the files and run mentoring visits in the health care facility under their geographical jurisdiction. A supervision checklist remains to be developed, however, as does a workshop to build expertise in monitoring and evaluation.

Recommendations

The team made the following recommendations.

1. A definition should be established (using the ICD 10 code) in the national health records database to identify TB suspects for resource planning, management and performance evaluation of the case finding.
2. The health record card system should be amended by including BCG-related fields (date, series) to ensure the accountability and monitoring of vaccination of newborns.
3. A data exchange should be established between the TB electronic register and the vital registration system, the laboratory database at the State Serum Institute and the social care register to avoid duplication and ensure the interoperability of data.
4. Social determinants should be added to the TB register.
5. Field supervision should be established for field performance evaluation and on-the-job mentoring (at least once a year and on an ad hoc basis when necessary).
6. A set of supervision checklists should be developed and a mentoring workshop should be established for the monitoring and evaluation regional focal point.
7. Online visualization of data should be developed.
8. Two impact indicators (TB notification and TB mortality rates), one outcome indicator (treatment success rate) and two output indicators (first-line drug susceptibility testing coverage and RR-TB prevalence rates) should be included in the list of health care facility performance indicators.
9. The social determinants leading to active TB and unfavourable treatment outcomes should be assessed.
10. A pilot project should be run on video-observed treatment.

TB care services for risk groups

Since 2013, targeted screening of homeless people in Nuuk has been carried out in collaboration with the administration of shelters and a nongovernmental organization (Salvation Army). This has been combined with information for users and local staff on the subjects of TB prevention and care and overall hygiene. Active TB cases have been detected.

This was followed up in 2013 and 2014 by contact-tracing among the crews of trawlers working along the west coast. TB coordinators from different hospitals worked together when the trawlers were in port to diagnose TB and ensure effective treatment.

At present no screening is envisaged for people going into prison, even though in other parts of the Region TB is often several times higher among prisoners than in the civilian sector.^{xxvi} In the prison visited, the facilities were fine for the inmates and did not seem to promote a high transmission rate. The high rate of alcohol consumption, however, is worrying: alcohol use increases the risk of active TB development and alcohol and illicit drug abuse can increase the risk of poor adherence to treatment.

There has been a sharp increase in sexually transmitted infections. Although HIV/AIDS numbers are currently low (two newly detected cases of HIV infection in 2014 and five in 2015), experience in other settings shows trends in HIV/AIDS following those of sexually transmitted infections.

Recommendations

The team made the following recommendations.

1. Pre-entry screening should be provided for prisons.^{xxvii}
2. Work should continue on legislation to limit alcohol consumption and stimulate a healthy lifestyle.
3. Active and latent TB case-finding should be ensured among PLWH. (for LTBI please refer to LTBI section)

Childhood TB management

A substantial number of children live in homes for pupils in the towns. They are considered vulnerable and a risk group for TB transmission and active TB development. National TB guidelines recommend preventive treatment for young people aged under 19 years with a positive IGRA after the exclusion on active TB.

All newborns are vaccinated with BCG. Paediatric formulations are available and used in Nuuk.

Recommendations

The team made the following recommendations.

1. Local authorities should be involved in awareness of TB and individual contact-tracing (pupil/student homes and schools, municipal administrations).
2. Children moving to Greenland and children staying more than three months in Greenland should receive BCG inoculations.

Anti-TB medicines, vaccine, equipment and supplies

All treatment (pharmaceutical) including treatment against TB is free in Greenland. There has not been reported any delivery problems neither to the central pharmacy in Nuuk, to the regional hospitals or the settlements. Standard regimens are used and followed and treatment outcome is registered. Medication for two full treatment regimens was present in every settlement. No drug supply interruptions were noticed, even among far isolated settlements.

The anti-TB drugs are usually prescribed in four fixed-dose combinations during the intensive phase of treatment. For the continuation of treatment Isoniazid and Rifampicin are given in separate tablets.

The number of BCG vaccinations in Greenland matches the number of births, and forecasting is based on the population prospects provided by the State agency of Greenland. The vials with vaccine contain up to 20 single doses.

BCG is included in the national calendar of vaccination. Vaccines supply was conventionally provided from the State Serum Institute, however for the last two years due to the production sustention, BCG was procured from China. Currently all forecasted medicines, vaccine and laboratory supplies (including Genexpert) are available at Queen Ingrid's Central Hospital, Nuuk.

Infection control

Infection control is the responsibility of the National Board of Health and the Hygiene Commission in Greenland in coordination with the Central Unit for Hospital Hygiene at the State Serum Institute in Denmark.

The national guidelines describe: (i) contact-tracing for each active TB case; (ii) active pulmonary TB patients to be isolated for one week from the start of effective treatment and two weeks if they are found with extensive parenchyma lesions with caverna on X-ray; and (iii) which cleaning procedure should be followed.

Good mechanical ventilation was available in the waiting area of Tasilaq hospital, although TB patients were admitted to the general hospital (including the maternity ward). No upper room shielded UVGI was available. Although the patients shortly after put on treatment would not be highly contagious, there is always a risk of drug resistance and treatment failure. In this case the hospital staff and other patients and visitors are put at risk. Negative pressure ventilation with HEPA filter is a heavy investment which needs maintenance.

Recommendations

The team made the following recommendations.

1. In addition to administrative measures, infectious cases and those starting treatment early should be separated.
2. Consideration should be given to installing UVGI (upper room shielded) in facilities to which patients are admitted.
3. Health care staff should be provided with P2 respirators in case they have to examine TB patients who have not yet smear or culture converted (P3 for MDR/XDR suspected).

Annex 1 PROGRAMME

| Sunday 5 June, Tasiilaq | |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 09:45–12.30 | <p>Welcome and presentation <i>Henrik Trykker and Masoud Dara</i></p> <ul style="list-style-type: none"> -Greenlandic health system <i>Anne Marie Ulrik</i> -Health in Greenland, TB history and previous TB strategies <i>Henrik Trykker</i> -Recommendation from the WHO report of the country visit in 2010 -TB current policy in the European Region -TB -strategy 2012–2016 <i>Rikke Bruun de Neergaard</i> -Diagnostic methods in Greenland, TB treatment, latent TB <i>Allan Gelvan</i> -Epidemiological data review <i>Rikke Bruun de Neergaard</i> -(TB and children) <i>Rikke Bruun de Neergaard</i> -Discussion -Closing remarks <i>Masoud Dara and Henrik Trykker</i> |
| Monday 6 June, Tasiilaq | |
| 09:00–13:00 | <p>Visit to Tasiilaq Hospital. Meeting with the hospital management, regional TB doctor and nurse. Welcome and presentation on TB management in Tasiilaq and settlements by Hans Chr. Florian</p> <p>Visit to the hospital:</p> <ul style="list-style-type: none"> -laboratory service and procedure -radiology service and procedure -medicine service and procedure -telemedicine, introduction to Pipaluk. <p>Discussion</p> |
| 14:00–16:00 | <p>Meeting with preventive workers in Sermersooq Municipality primary sector Kurt Rokholm Pedersen</p> |
| Tuesday 7 June, Tasiilaq | |
| 10:00 | <p>Meeting with head teacher Lars Formsgaard of Tasiilaq public school and visit to the school homes for pupils</p> |
| 14:00–16:00 | <p>Visit to Tasiilaq correctional establishment, meeting with Thomas Fredhøj, head</p> |
| Wednesday 8 June, Kulusuk | |
| 10:45–13:00 | <p>Visit to Kulusuk nursing station with two local health assistants:</p> <ul style="list-style-type: none"> -laboratory service and procedure -radiology service and procedure -medicine service and procedure -telemedicine, Pipaluk -TB management in Kulusuk |
| Thursday 9 June, Nuuk | |
| 09:30–13:00 | <p>Visit to Queen Ingrid Hospital by the National TB team</p> <ul style="list-style-type: none"> -Welcome and presentation <i>Joanis Erik and WHO team leader</i> -Visit to the central laboratory and interview with the head <i>Inge-Lise Kleist and Peter Poulsen</i> -Visit to the Radiology Department <i>Kai Holm or Folmer Lynggaard</i> -Visit to the TB ambulatory and medicine department <i>TB team</i> -Interview with the national pharmacologist <i>Inge Mortensen</i> -Perspective of the Regional TB Nurse, Kujataa <i>Michael Gerfelt</i> -Next step <i>Allan Gelvan</i> -Discussion |
| 14:30 | <p>Debriefing at Queen Ingrid Hospital with Anne Marie Ulrik on skype</p> |
| 16:00 | <p>Debriefing with the Minister of Health, Mrs Doris Jacobsen</p> |
| Friday 10 June, Qeqertarsuaat | |
| 07:00–18:00 | <p>Visit to the Rubin mine with Managing Director Bent Olsvig Jensen On return trip to Nuuk: Discussion of preliminary findings</p> |

Annex 2

KEY PERSONS MET/ORGANIZATIONS VISITED

Ministry of Health

- Mrs Doris Jacobsen, Minister of Health
- Mrs Lone Nukaaraq Møller, Head, Health Department
- Ms Julie Flyger Kristensen, Health Consultant

Greenlandic Agency of Health and Prevention

- Mr Joanis Erik, Director, National Management of Health
- Dr Anne Marie Ulrik, Executive Medical Officer

Queen Ingrid's Central Hospital, Nuuk

- Dr Folmer Lyngaard, Managing Chief Physician, Department of Medicine
- Dr Allan Gelvan, National TB Doctor, Chief Physician, Department of Medicine
- Mrs Anne-Birgitte Jensen, Head Nurse, Department of Medicine
- Mrs Anna K. Neve, National TB Nurse, Department of Medicine
- Mrs Inge-Lise Kleist, Chief Medical Technologist, Central Laboratory
- Mr Peter Poulsen, Molecular Diagnostics Technologist, Central Laboratory
- Mrs Inge Mortensen, Chief Pharmaceutical Officer, Agency for Health and Prevention

The National Board of Health

- Dr Henrik Trykker, Chief Medical Officer
- Mrs Rikke Bruun de Neergaard, Nurse, TB Consultant

Tasiilaq municipality

- Dr Hans Christian Florian, Regional TB Doctor
- Mrs Birthe Mikaelsen, nurse
- Mr Kurt Rokholm Pedersen, primary sector
- Ms Margit Weismann, health consultant, former TB nurse in East Greenland
- Mr Lars Formsgaard, Head teacher, public school
- Mr Thomas Fredhøj, Leader, local correctional establishment

Kulusuk and Pipaluk

- Mrs Tobiasine Boassens, Health assistant, nursing station, Kulusuk
- Mrs Else Nuko, Health assistant, nursing station, Kulusuk

Qaqortoq

- Mr Michael Gerfelt, Regional TB nurse, Kujataa, Qaqortoq Hospital

Qeqertarsuatsiaat Rubin Mine

- Bent Olsvig Jensen, Managing Director

Annex 3

ONE NURSE'S QUEST TO TRACK DOWN TB ON THE EASTERN EDGE OF GREENLAND

Web: <http://www.euro.who.int/en/health-topics/communicable-diseases/tuberculosis/news/news/2016/06/one-nurses-quest-to-track-down-tb-on-the-eastern-edge-of-greenland>, published on 10 June 2016.

Interviewer: Dr Masoud DARAⁱ

Image: Dr Andrei DADUⁱ

Editor: Faith Estrild Ivy Kilford VORTINGⁱ

ⁱThe WHO Regional Office for Europe

The town of Tasiilaq, Greenland, sits on the shore of a natural harbour in a dramatic fjord. It is the most populous community on Greenland's east coast, with slightly more than 2000 inhabitants. It is also home to a concerning number of TB cases, with a TB rate of 900 cases per 100 000 population. In comparison, the average rate among the 53 countries of the WHO European Region was 37 per 100 000 in 2014.



Margit Weismann came to Tasiilaq in 2005, after completing her nursing studies in Denmark. In 2007, she moved to the even more remote community of Kuummiut, where she served as the sole nurse practitioner for about 400 people. There was no doctor in the settlement to support her work.

Then, in 2009, the tiny community experienced a TB epidemic. The high number of TB cases made some people afraid to come to Kuummiut, further isolating Weismann and



her fellow residents. Though she had little first-hand knowledge about TB, Margit became the health worker primarily responsible for dealing with the epidemic. This experience made her interested to learn more. When she left Kuummiut after three years, she came back to Tasiilaq to work specifically as a TB nurse.

Margit's daily tasks in this role included checkups with her TB patients and examinations of their family and friends, to see whether they had also been infected with the disease.

"It was very interesting work, but it was also difficult," she said. "It was difficult to reach all the people because some of them didn't want to get treatment. You really had to go out and grab patients."

As the first TB nurse ever in Tasiilaq, Margit pioneered new techniques for dealing with the disease. She created a map where she could track all of the TB cases in the area. This type of tracking helped her dispel certain false assumptions about TB, for example that most cases occurred among people living in old houses. In fact, she concluded that more cases occurred among people living in newer houses. These houses were more expensive and, therefore, tended to have more people living in them and sharing the cost. This meant the disease had more opportunities to spread and infect new people.

"The most important thing in my job was to find the TB," said Weismann. "You had to be 100% focused on TB, and nothing else. Then you find a lot of TB."

Though Margit no longer works exclusively as a TB nurse, she continues to view the disease as an important priority and one that deserves a prominent place on the country's political agenda. But she believes that, in order to effectively fight TB in Tasiilaq and across Greenland, you can't just go looking for the disease. It is vital to have a broader perspective. "To prevent TB, you need better houses, cheaper healthy foods, better family conditions, better schools," she said. "The social problems are much bigger than TB. But if you solve those, then you can also get rid of TB."

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