TB and DM

Margaretha Sariko

Background

- Diabetes is a risk factor for active tuberculosis (TB); meta-analysis estimates patients with diabetes to be ~3 times more likely than those without to develop TB.

- In TB disease sittings, patients with diabetes have worse treatment outcomes: Some studies have reported a higher mortality compared to non-diabetics when controlling for other co-morbidities.

- Screening for diabetes among TB patients has found varying rates of new diabetes cases, ranging from 2-35%, depending on the population study.

  Eg, the number of TB patients needed to screen (NNS) to identify one new case of diabetes in Kerala, India was only 4.

Background cont…

- Subsequent recommendations by the WHO to study implementation strategies of bidirectional screening for TB and diabetes have been met with varying levels of uptake by national TB programs in resource-limited settings.

- In Tanzania, the National TB and Leprosy Program does not provide direct guidance on how to screen for diabetes among TB patients.

- We are unaware of any recent studies from Tanzania that could guide the best practice for diabetes screening and determine which subsets of TB patients may be at highest risk.

Background cont….

- Kibong'oto National TB Hospital (KNTH) is a regional referral hospital for TB cases from Northern Tanzania, and the national referral hospital for multidrug-resistant (MDR)-TB.

- We therefore sought to perform glycated hemoglobin (HgbA1c) testing among all patients admitted to KNTH to determine the point prevalence of diabetes (HgbA1c ≥6.5%) and prediabetes (HgbA1c 5.7-6.4%).

- HgbA1c values were stratified by American Diabetes Association recommendations for normal, prediabetes and diabetes

Methodology

- A hospital-based cross-sectional study which was conducted at KNTH, aimed to screen all admitted patients. KNTH had inpatient census of 150 TB cases including MDR-TB patients (at time of screening)

- TB wards are segregated by gender and admitted cases, which are new cases, retreatment cases and MDR cases.

- Hospital charts were review for basic patient demographics and sputum smear status on admission (for pulmonary TB patients).

- Prior diabetes diagnosis, Height (centimeters) and weight (kilograms) were measured for calculation of BMI

Methodology Cont…

- HgbA1c measurement was performed with the point-of-care DCA System Analyzer (Seimens, USA). Validation was performed with control samples.

- The patient's finger was cleaned with alcohol and dried with sterile swab prior finger pricking for blood collection (1 µl) to the system's cartridge. Samples were analyzed within 5 minutes.

RESULTS: Demographic Characterists of all patients

•A total of 148 patients were screened accounting for all (100%) of admitted patients during one week. As reflective of usual hospital demographics, the majority were male (72%) and the mean age was 40.0 ±13.5 years. Smear results, 112 (82%) were positive. A narrow range of BMI was noted, mean 20.6 ±3.6%. Only 3 patients (2%) had a known history of diabetes.

Table 1 Demographic Characteristics of all patients N=148

Gender (%N)	
Female	**41 (28)**
Male	**107 (72)**
Smear status (%N)	
Negative	**24 (16)**
Scanty	**9 (6)**
1+	**30 (20)**
2+	**38 (26)**
3+	**35 (24)**
Extrapulmonary	**7 (5)**
Not available	**5 (3)**
Body Mass Index*, mean ±SD	**20.6 ±3.6**
Known history of diabetes (%N)	
No	**145 (98)**
Yes	**3 (2)**

Hemoglobin A1c distribution among different treatment categories

•144 (97%) of patients had HgbA1c results, as very low hemoglobin limited processing in 4 patients. Of the 141 patients without a prior diabetes diagnosis, 3 new diabetes cases were found, yielding a NNS to diagnose 1 new case of diabetes of 47 . However, no re-treatment case was a known diabetic, therefore the NNS among re-treatment cases dropped to 11. The mean HgbA1c among diabetics was 9.5 ±3.4 percent.

Table 2: HbA1c distribution among different treatment categories

	Total N=144*	New, N=59	Retreatment, N=22	MDR, N=63
Normal, HgbA1c≤5.6 number (%N)	110 (77)	46 (78)	11 (50)	53 (84)
Prediabetes, HgbA1c≥5.7<6.5 number (%N)	28 (19)	11 (19)	9 (41)	8 (13)
Diabetes, HgbA1c≥6.5 number (%N)	6 (4)	2 (3)	2 (9)	2 (3)

Step wise increase in BMI

• A stepwise increase of BMI was observed between patients with normal HgbA1c and pre-diabetes, BMI increase of 2.3±0.74 (p=0.05) and between those with normal HgbA1c and diabetes, 6.2±1.69 (p=0.01) Table 3:

Table 3: Step wise increase in BMI

	Normal, **HgbA1c≤5.6**	**Prediabetes** **HgbA1c≥5.7<6.5**	**Diabetes** **HgbA1c≥6.5**
BMI%, mean ±SD	**19.6 ±3.3**	**21.9 ±3.0** **p=0.05**	**25.8 ±4.9** **p=0.01**
Age, mean ±SD	**38.9 ±14.6**	**41.9 ±8.8** **p=0.53**	**49.5 ±8.1** **p=0.12**

Discussion

- Diabetes screening by HgbA1c among TB patients found a NNS of 47 to diagnose one new case of diabetes.
- However, half of all retreatment patients had prediabetes or diabetes, which was not the case for patients admitted with an initial episode of TB or MDR-TB.
- The diabetes co-prevalence among our population contrasts to the far higher proportions found by HgbA1c screening in studies from Southeast Asia, but demonstrates the importance of performing such local investigation before adopting widespread policy.

Discussion

- Given the association of the diabetic disease state with poor treatment outcomes, there is biologic plausibility for our finding of worse glycemic control in patients with recent TB treatment failure or relapse because, diabetes/TB patients have suboptimal circulating anti-TB medications that could have predisposed to treatment failure.
- Retreatment patients represent a high yield subpopulation for screening. KIDH administration now plans to screen all retreatment patients prospectively to determine if this association is maintained

Discussion

- Other study of this kind in Tanzania was performed in 1990 for exclusively smear positive pulmonary TB patients, and though patients were screened by oral glucose tolerance testing (OGTT) the overall prevalence of diabetes was 4% and did not markedly differ from our findings.

- HgbA1c method give the ease of administration in our setting and the clinically actionable snapshot of glycemic control over the patient's prior 3 months.

- In our resource-limited setting, such measurement allows more informed long-term individualization of oral hypoglycemic and insulin-based therapy.

Conclusion

- Despite the limitations inherent in a point-prevalence design, we believe this type of initiative allows for a resource-conscious deployment of diabetes screening informed by local epidemiology.

- Prospective study among high-risk populations such as those being admitted for retreatment, patients with higher BMI or age, or overt symptoms of diabetes will further refine our approach.

Conclusion

- We recommend in other settings where our findings could be generalizable, for instance in East Africa, that similar local screening initiatives be pursued.

- Bidirectional screening for TB in diabetes clinic patients for instance may also be worthwhile given the prospective relation of incident TB and diabetic disease severity found earlier in Tanzania.

AKNOWLEDGEMENT

- **All supervisors**
- **My sponsors**
- **KNTH Management**
- **KNTHStaff**
- **ALL PATIENTS**

THANK YOU FOR LISTENING