

Editorial

Tuberculosis in Pakistan: A decade of progress, a future of challenge

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Tuberculosis (TB) is a major public health problem in Pakistan. TB has been prevalent in Pakistan and unfortunately it has been one of the neglected health areas in the past. Pakistan ranks 8th amongst the countries with highest burden of TB in the world. Pakistan contributes about 44% of tuberculosis burden in the Eastern Mediterranean Region. According to the World Health Organization (WHO), the incidence of sputum positive TB cases in Pakistan is 80/100,000 per year and for all types it is 177/100,000. TB is responsible for 5.1 percent of the total national disease burden in Pakistan. The impact of TB on socio economic status is substantial.¹ The National TB Control Program, is responsible for developing national guidelines, framing policies and generating resources for implementation of TB control measures at Provincial and district level. The DOTS was adopted as National Strategy in 2000 and expanded to all public health facilities as part of primary health care. The Program was successful in achieving 70 % case detection and 85 % treatment outcome of the global target set by STOP TB Partnership. Despite rapid expansion and consolidation of TB care there are still many issues related to TB Control. The disease is directly linked with socioeconomic status and 75 % patients are in productive age group.

Many patients consult untrained practitioners in the informal health sector with delays in diagnoses. Suboptimal case detection and treatment, lead to failure in achieving program target goals. This special supplement of the Journal of the Pakistan Medical Association presents several peer-reviewed papers originally published elsewhere²⁻²⁷ that we have assembled to provide an update on key issues of the Pakistani TB situation. In addition, there are three²⁸⁻³⁰ original articles in this issue to stimulate debate as to how TB control and prevention can be revitalized in Pakistan.

Origin of this special issue

It is easier to make research results readily available to persons who need them now in the internet age. Nonetheless, there are many health professionals in Pakistan who do not have reliable access to the worldwide web. If a health professional or worker has a computer with excellent internet access, HINARI (<http://www.who.int/hinari/en/>) is a WHO-sponsored system that enables journal article access free-of-charge from computer networks in lower income countries.

The PubMed system is used worldwide to read abstracts and increasingly has full reference access thanks to the PubMed Central system (<http://www.ncbi.nlm.nih.gov/PubMed/>) and liberalization of access by some journals, particular on-line journals. If someone does not have good internet access, but has a computer, eGranery (<http://www.widernet.org/digitallibrary/>) is an effort to bring global resources to an intra-net, rather than inter-net, i.e., one can access it from a local computer network without being logged onto the internet. This is important for institutions and individuals with computers whose internet access may be limited by availability, cost, or the low band width so familiar in many lower-income settings. However, for someone with no or limited computer access, there is still a need for a special supplement like this one to reach a diverse audience of front line service providers.

Many Pakistani researchers have overcome obstacles, both scientific and other, to make important contributions to TB research. Many are cited here, but space and costs prohibited accommodation of all eligible references. Hence, we provide a comprehensive list of 218 articles at the end of this editorial which is titled "Special Bibliography", found in a PubMed search from 1997 through 3 December 2008. They include human-related articles published in English that came from searching "Pakistan AND tuberculosis". We have reproduced 26 papers selected from 1998-2007 in this special issue.²⁻²⁶ They are all original manuscripts. We hope that this will inspire government leaders and donors to recognize the research talent and opportunity in the nation, as well as the research need.

For this special issue, only Index Medicus-referenced articles were selected, with a priority given to those with public health importance focusing on pertinent issues in Pakistan. Thanks to the generosity of many publishers listed below, we were able to reproduce the publications of these key TB studies from Pakistan without cost, thereby increasing the convenience of their access to readers of the JPMA. There were a few articles which could not be included because publishers required a processing fee to reprint their articles; we preferred to devote our limited budget to purchase and distributions of additional copies of the supplement. We believe that the publishers demanding fees should reconsider these policies to permit free reproduction of articles for

legitimate purposes in the developing country where the research was conducted.

This supplemental issue seeks to reach practicing physicians, policy makers, health care managers, senior nurses, microbiologists, medical researchers, university faculty and students, and public health staff in Pakistan. We believe that an earlier analogous supplement met a similar need in the HIV/AIDS field.

Infrastructure and Tuberculosis Management Challenges in Pakistan

The WHO directly observed therapy-short course (DOTS) strategy was implemented in Pakistan in year 2001. It took four years to bring DOTS coverage to all public health facilities (by mid-2005), and the country remains far behind the global targets of case detection rate of 70% and treatment success rate of 85%. Among the important challenges for TB control in Pakistan are a lack of community involvement, limited engagement of the private sector, increasing number of multiple drug-resistant (MDR) cases and a recent rise in HIV cases among injection drug users who are also at much higher risk of TB.³⁰ We anticipate an increased burden of TB-HIV co-infection and continuing rise in the proportion of MDR-TB cases, unless there is aggressive intervention.

Pakistan spends a relatively small proportion of its gross domestic product (GDP) on health. In 2000, Pakistan spent 0.8% of GDP, lower than investments by its south Asian neighbors: India, 0.7%; Bangladesh, 1.7%; Nepal, 1.2%; Sri Lanka, 1.5%.^{31,32} All are far below such nations as the United States with its 9.7% GDP investment in health in 2003.³³ Low health expenditures correlate with high military investments. Pakistan spent 22% of its total governmental budget on defense in 2000.³⁴ Medical and public health research investments are exceedingly low in Pakistan. The overall low governmental commitment to the health sector results in the particular neglect of prevention, as curative services command the lion's share of these scarce resources.

The articles in this special issue identify these specific needs of the Pakistani national TB control program:

1. ENGAGE THE PRIVATE SECTOR

A significant proportion of patients seek medical advice from private sector, including formal and informal sectors. Given the magnitude of the TB problem, the role of the private sector cannot be underestimated. The importance of private health care providers has also been recognized by the Stop TB Partnership with its emphasis on integrating private health care providers into DOTS strategy efforts. Well-organized educational efforts and logistical support to private sector health care providers can make it easier for them to follow standard TB control guidelines (both DOTS and

DOTS-Plus for MDR-TB).³⁵ We had success in upgrading the syndromic management of sexually transmitted diseases by private providers in the informal sector in one Karachi study, but the government did not expand (or even continue) this model program.³⁶

2. DRUG MANAGEMENT AND LOGISTICS

Proper anti-TB drug management is an essential component for success of TB DOTS strategy.³⁷ Frequent stock-outs of TB drugs and diagnostic supplies at first level care facilities are major impediments to the TB case detection and treatment, fueling incidence and MDR-TB.³⁸ The stock management systems at the central and district levels are weak such that distribution of TB drugs is far less reliable than distribution of most private sector products (e.g., petrol for autos and trucks, soft drinks, commercial goods).³⁷ Effective drug supply systems, inventory management, methods of drug quality assurance, and proper use of anti-TB drugs by practitioners is essential.

3. SPECIAL FACILITIES

Targeted programs must engage prisons, jails, HIV/STD programs, specific high-risk occupational groups, illicit drug users, and persons living on the street. Links to community services are essential for persons leaving incarceration.

4. OPERATIONS RESEARCH

Operations research (OR) is necessary to address issues like now-uncontrolled private sector activities, poor management of defaulters, and lack of community involvement.³⁹ Field-based research at the community level is essential to better identify problems from patient, provider, and policy-maker perspectives; solutions to improve program utilization can then be much better informed.³⁵

5. MDR-TB and TB/HIV

MDR-TB and TB/HIV are the emerging health issues in Pakistan and a great challenge to public health sector. In Pakistan, there is a lack of technical expertise in both areas. MDR-TB (through DOTS-Plus) and TB/HIV (via programme coordination and communication) are now identified as one of the challenges in broadening the activities of the National TB Programme beyond basic DOTS.⁴⁰

These issues are very familiar to experts in TB, but may not be familiar to the diverse readership of the JPMA.

Role of future research in the fight against TB in Pakistan

We are confident that research will play a vital role in the fight against TB. We need answers to many questions:

♦ How should primary, asymptomatic TB be diagnosed and managed with high background BCG usage rates (complicating diagnosis) and INH resistance levels (complicating treatment)? Will isoniazid preventive therapy be appropriate or are alternatives needed?

♦ What strategies will work to maximize DOTS coverage, given Pakistani logistical challenges? Can we succeed in rural areas, including areas of civil strife, through community engagement?

♦ How do we optimize HIV and TB diagnosis and care, including program integration to enable simpler care logistics from a patient's point of view?

♦ Can we do better than the classic sputum examination to diagnose TB? What is the most suitable resistance assay, given limitations in laboratories, especially in rural areas?

♦ What programs work best and why? What programs work most poorly and why?

♦ How can Pakistan's politicians and powerful business leaders be influenced to invest more into health?

These and many other questions remain unanswered for Pakistan, suggesting an urgent need for research, even as we seek to improve programs. Implementation science is a term for the work needed to increase coverage of programs that we already have in place.⁴¹ Operations research is a component of implementation science that uses program process and outcome data in a feedback loop to improve program functioning. The guest editors are pleased that original articles have been provided for this special supplement and that publishers permitted reproduction of papers that we felt to be especially salient. We think they represent, in aggregate, a call-to-arms in the fight against TB in Pakistan.

References

- National TB Control Programme (<http://www.ntp.gov.pk/about.htm> Accessed on 3rd February 2009).
- Muhammad KK, Sarfaraz J, Tayyeb IM. Factors Affecting Tuberculosis Control: Decision-making at The Household Level. *J Coll Physicians Surg Pak*. 2003, Vol. 13 (12):697-700.
- Memon AR, Memon MA, Altaf A, Shah SA, Zuberi BF, Qadeer R, Afsar S. Frequency of dual Tuberculosis/Human Immunodeficiency Virus infection in patients presenting at tertiary care centers at Karachi. *J Coll Physicians Surg Pak*. 2007 Oct;17(10):591-593.
- Butt T, Ahmad RN, Kazmi SY, Afzal RK, Mahmood A. An update on the diagnosis of tuberculosis. *J Coll Physicians Surg Pak*. 2003 Dec;13(12):728-34.
- Rizvi N, Shah RH, Inayat N, Hussain N. Differences in Clinical Presentation of Pulmonary Tuberculosis in association with Age. *J Pak Med Assoc*. 2003 Aug;53(8):321-4.
- Khan JA, Muhammad I, Zaki A, Beg M, Hussain SF, Rizvi N. Knowledge, Attitude and Misconceptions regarding Tuberculosis in Pakistani Patients. *J Pak Med Assoc*. 2006 May;56(5):211-4.
- Habib F, Baig L. Cost of DOTS for tuberculous patients. *J Pak Med Assoc*. 2006 May;56(5):207-10.
- Hussain A, Mirza Z, Qureshi FA, Hafeez A. Adherence of Private Practitioners with the National Tuberculosis Treatment Guidelines in Pakistan: a survey report. *J Pak Med Assoc*. 2005 Jan;55(1):17-9.
- Rao NA, Sadiq MA. Recent Trends in the Radiological Presentation of Pulmonary Tuberculosis in Pakistani Adults. *J Pak Med Assoc*. 2002 Nov;52(11):501-3.
- Israr SM. Is Ministry of Health fully prepared to implement an effective DOTS program in Pakistan? An operations research on TB control program in the public health sector in Sindh. *J Pak Med Assoc*. 2003 Aug;53(8):324-7.
- Rao NA. New drugs in resistant tuberculosis. *J Pak Med Assoc*. 2007 May;57(5):252-6.
- Ahmed M, Aziz S. Pattern of tuberculosis in general practice. *J Pak Med Assoc*. 1998 Jun;48(6):183-4.
- De Muynck A, Siddiqi S, Ghaffar A, Sadiq H. Tuberculosis control in Pakistan: critical analysis of its implementation. *J Pak Med Assoc*. 2001 Jan;51(1):41-7.
- Liefooghe R, Muynck AD. The dynamics of tuberculosis treatment adherence. *J Pak Med Assoc*. 2001 Jan;51(1):3-9.
- Aziz S, Lodi T, Alam SE. BCG scar survey in Karachi schools. *J Pak Med Assoc*. 1994 Jan;44(1):17.
- Irfan S, Hassan Q, Hasan R. Assessment of resistance in multi drug resistant tuberculosis patients. *J Pak Med Assoc*. 2006 Sep;56(9):397-400.
- Shah SK, Sadiq H, Khalil M, Noor A, Rasheed G, Shah SM, Ahmad N. Do private doctors follow national guidelines for managing pulmonary tuberculosis in Pakistan? *East Mediterr Health J*. 2003 Jul;9(4):776-88.
- Agboatwalla M, Kazi GN, Shah SK, Tariq M. Gender perspectives on knowledge and practices regarding tuberculosis in urban and rural areas in Pakistan. *East Mediterr Health J*. 2003 Jul;9(4):732-40.
- Shah SA, Mujeeb SA, Mirza A, Nabi KG, Siddiqui Q. Prevalence of pulmonary tuberculosis in Karachi juvenile jail, Pakistan. *East Mediterr Health J*. 2003 Jul;9(4):667-74.
- Rathi SK, Akhtar S, Rahbar MH, Azam SI. Prevalence and risk factors associated with tuberculin skin test positivity among household contacts of smear-positive pulmonary tuberculosis cases in Umerkot, Pakistan. *Int J Tuberc Lung Dis*. 2002 Oct;6(10):851-7.
- Ali NS, Hussain SF, Azam SI. Is there a value of mantoux test and erythrocyte sedimentation rate in pre-employment screening of health care workers for tuberculosis in a high prevalence country? *Int J Tuberc Lung Dis*. 2002 Nov;6(11):1012-6.
- Alvi AR, Hussain SF, Shah MA, Khalida M, Shamsudin M. Prevalence of pulmonary tuberculosis on the roof of the world. *Int J Tuberc Lung Dis*. 1998 Nov;2(11):909-13.
- Khan N, Mian I, Zia-Ullah J, Muhammad J. Performance of ICT-TB test in the detection of pulmonary and extra-pulmonary tuberculosis. *J Ayub Med Coll Abbottabad*. 2004 Apr-Jun;16(2):55-6.
- Khan JA, Akbani F, Malik A, Kazi GN, Aslam F, Hussain SF. Effect of providing free sputum microscopy service to private practitioners on case notification to National Tuberculosis Control Program. *J Ayub Med Coll Abbottabad*. 2005 Oct-Dec;17(4):31-5.
- Ibrahim KM, Khan S, Laaser U. Tuberculosis control: current status, challenges and barriers ahead in 22 high endemic countries. *J Ayub Med Coll Abbottabad*. 2002 Oct-Dec;14(4):11-5.
- Yasmeen N, Kanjee A. Cutaneous tuberculosis: a three year prospective study. *J Pak Med Assoc*. 2005 Jan;55(1):10-2.
- Hasan Z, Tanveer M, Kanji A, Hasan Q, Ghebremichael S, Hasan R. Spoligotyping of Mycobacterium tuberculosis isolates from Pakistan reveals predominance of Central Asian Strain 1 and Beijing isolates. *J Clin Microbiol*. 2006 May;44(5):1763-8.
- Ghiyas Ahmad, Qadeer Ejaz, Noor Ahmad, R Fatima, Z Khurshed. Defaulting Rate of TB Patients among Seasonal Migrants: A Case Study of Balochistan.
- Sharaf A Shah, Rab Nawaz Samo, Arshad Altaf, M. Ashraf Memon, Rafique Khanani Sten Vermund. Screening of TB Patients for HIV Infection in Concentrated HIV Epidemic Setting in Sindh, Pakistan.
- Ghulam Sarwar Pirkani, Ejaz Qadeer, Noor Ahmed, Fatima Razia, Zia Khurshed, Lubna Khalil, Mohammed Shuib, Abdul Naeem. Impact of training of Religious Leaders about Tuberculosis on Case Detection Rate in Balochistan, Pakistan.
- Vermund SH, White H, Shah SA, Altaf A, Kristensen S, Khanani R, Mujeeb AS: HIV/AIDS in Pakistan: Has the explosion begun? *J Pak Med Assn* 2006; 56 (suppl 1): S1-S3.
- Ghaffar A, Kazi BM, Salman M. Health care systems in transition III. Pakistan, Part I. An overview of the health care system in Pakistan. *J Public Health Med*.

2000 Mar;22(1):38-42.

33. World Bank. World development report, Washington, DC: World Bank, 1998-1999.
34. Organisation for Economic Co-operation and Development. <http://www.oecd.org/health/healthdata>. OECD Health Data 2006, from the OECD Internet subscription database updated October 10, 2006. Accessed on 29 August 2008.
35. Columbia International Affairs Online: <http://www.ciaonet.org/> Accessed on 28 August 2008.
36. Khadim MK, Sarfaraz J, Masud TI. Factors affecting tuberculosis control: decision-making at the household level. *J Coll Physicians Surg Pak*. 2003 Dec;13(12):697-700.
37. Shah SA, Kristensen S, Memon MA, White HL, Vermund SH. Syndromic management training for non-formal care providers in Pakistan improves quality of care for sexually transmitted diseases: a randomized clinical trial. *Southeast Asian J Trop Med Public Health* 2007;38(4):737-48.
38. WHO EMRO (www.emro.who.int/stb/ Accessed on 2nd Feb 2009).
39. Government of Pakistan, Ministry of health http://www.pakistan.gov.pk/divisions/ContentInfo.jsp?DivID=25&cPath=254_260&ContentID=1637 Accessed on 28 August 2008.
40. Operational research in TB control programmes. Challenges in the WHO Eastern Mediterranean region. By Dr. A. Seita www.who.int/tdr/publications/tdrnews/news65/tbresearch.htm Accessed on 28 August 2008.
41. Global Tuberculosis Control, WHO Report 2008, 133.
42. Madon T, Hofman KJ, Kupfer L, Glass RI. Public health. Implementation science. *Science* 2007;318:1728-9.
14. Ullah K, Raza S, Ahmed P, Chaudhry QU, Satti TM, Ahmed S, Mirza SH, Akhtar F, Kamal K, Akhtar FM. Post-transplant infections: single center experience from the developing world. *Int J Infect Dis*. 2008 Mar;12(2):203-14. Epub 2007 Oct 24.
15. Khurram M, Tariq M, Shahid P. Breast cancer with associated granulomatous axillary lymphadenitis: a diagnostic and clinical dilemma in regions with high prevalence of tuberculosis. *Pathol Res Pract*. 2007;203(10):699-704. Epub 2007 Sep 7.
16. Irfan M, Hussain SF, Jabeen K, Islam M. Drug susceptibility pattern of Mycobacterium tuberculosis in adult patients with miliary tuberculosis. *Trop Doct*. 2007 Jul;37(3):182-4.
17. Kamani L, Ahmed A, Shah M, Hasan S, Jafri W. Rectal tuberculosis: the great mimic. *Endoscopy*. 2007 Feb;39 Suppl 1:E227-8. Epub 2007 Aug 3. No abstract available.
18. Shahbaz Sarwar CM, Fatimi S. Characteristics of recurrent pericardial effusions. *Singapore Med J*. 2007 Aug;48(8):725-8.
19. Rafique M. Nephrectomy: indications, complications and mortality in 154 consecutive patients. *J Pak Med Assoc*. 2007 Jun;57(6):308-11.
20. Akhtar S, Haidri FR, Memon AM. Drug resistance to tuberculosis in a tertiary care setting in Karachi. *J Pak Med Assoc*. 2007 Jun;57(6):282-4.
21. Bin Sarwar Zubairi A, Tanveer-ul-Haq, Fatima K, Azeemuddin M, Zubairi MA, Irfan M. Bronchial artery embolization in the treatment of massive hemoptysis. *Saudi Med J*. 2007 Jul;28(7):1076-9.
22. Nishtar S. The Gateway Paper--preventive and promotive programs in Pakistan and health reforms in Pakistan. *J Pak Med Assoc*. 2006 Dec;56(12 Suppl 4):S51-65.
23. Rao NA. New drugs in resistant tuberculosis. *J Pak Med Assoc*. 2007 May;57(5):252-6.
24. Khan MS, Dar O, Sismanidis C, Shah K, Godfrey-Faussett P. Improvement of tuberculosis case detection and reduction of discrepancies between men and women by simple sputum-submission instructions: a pragmatic randomized controlled trial. *Lancet*. 2007 Jun 9;369(9577):1955-60.
25. Jamil B, Shahid F, Hasan Z, Nasir N, Razzaki T, Dawood G, Hussain R. Interferon gamma/IL10 ratio defines the disease severity in pulmonary and extra pulmonary tuberculosis. *Tuberculosis (Edinb)*. 2007 Jul;87(4):279-87. Epub 2007 May 29.
26. Akhtar S, White F, Hasan R, Rozi S, Younus M, Ahmed F, Husain S, Khan BS. Hyperendemic pulmonary tuberculosis in peri-urban areas of Karachi, Pakistan. *BMC Public Health*. 2007 May 3;7:70.
27. Jabbar A, Hussain SF, Khan AA. Clinical characteristics of pulmonary tuberculosis in adult Pakistani patients with co-existing diabetes mellitus. *East Mediterr Health J*. 2006 Sep;12(5):522-7.
28. Irfan S, Hasan R, Kanji A, Hassan Q, Azam I. Evaluation of a microcolony detection method and phage assay for rapid detection of Mycobacterium tuberculosis in sputum samples. *Southeast Asian J Trop Med Public Health*. 2006 Nov;37(6):1187-95.
29. Mahmood K, Khan A, Malik SA, Ilyas M. Mikulicz syndrome, an uncommon entity in Pakistan. *J Coll Physicians Surg Pak*. 2007 Feb;17(2):101-2.
30. Janjua SA, Khachemoune A, Guillen S. Tuberculosis verrucosa cutis presenting as an annular hyperkeratotic plaque. *Cutis*. 2006 Nov;78(5):309-16.
31. Irfan S, Hassan Q, Hasan R. Assessment of resistance in multi drug resistant tuberculosis patients. *J Pak Med Assoc*. 2006 Sep;56(9):397-400.
32. Mehnaz A. Tuberculosis in children. *J Pak Med Assoc*. 2006 Sep;56(9):390-1.
33. Khan R, Abid S, Jafri W, Abbas Z, Hameed K, Ahmad Z. Diagnostic dilemma of abdominal tuberculosis in non-HIV patients: an ongoing challenge for physicians. *World J Gastroenterol*. 2006 Oct 21;12(39):6371-5.
34. Fatimi SH, Javed MA, Ahmad U, Siddiqi BI, Salahuddin N. Tuberculous hilar lymph nodes leading to tracheopulmonary artery fistula and pseudoaneurysm of pulmonary artery. *Ann Thorac Surg*. 2006 Nov;82(5):e35-6.
35. Ullah K, Awan ZI. Pattern of the cause of death in adult males - a perspective on autopsy. *J Coll Physicians Surg Pak*. 2006 Nov;16(11):712-6.
36. Naqvi R, Akhtar S, Noor H, Saeed T, Bhatti S, Sheikh R, Ahmed E, Akhtar F, Naqvi A, Rizvi A. Efficacy of isoniazid prophylaxis in renal allograft recipients. *Transplant Proc*. 2006 Sep;38(7):2057-8.
37. Shaheen R, Subhan F, Tahir F. Epidemiology of genital tuberculosis in infertile population. *J Pak Med Assoc*. 2006 Jul;56(7):306-9.

Special Bibliography

1. Shamsi Ts, Hashmi K, Adil S, Ahmad P, Irfan M, Raza S, Masood N, Shaikh U, Satti T, Farzana T, Ansari S. The stem cell transplant program in Pakistan — the first decade. *Bone Marrow Transplant*. 2008 Aug;42 Suppl 1:S114-S117.
2. Rehman A, Saeed A, Jamil K, Zaidi A, Azeem Q, Abdullah K, Rustam T, Qureshi N, Akram M. Hypertrophic pyloroduodenal tuberculosis. *J Coll Physicians Surg Pak*. 2008 Aug;18(8):509-11.
3. Bokhari I, Shah SS, Inamullah, Mehmood Z, Ali SU, Khan A. Tubercular fistula-in-ano. *J Coll Physicians Surg Pak*. 2008 Jul;18(7):401-3.
4. Nevin RL, Silvestri JW, Hu Z, Tobler SK, Trotta RF. Suspected pulmonary tuberculosis exposure at a remote U.S. army camp in northeastern Afghanistan, 2007. *Mil Med*. 2008 Jul;173(7):684-8.
5. Khan AA, Khan A. HIV/tuberculosis co-infection: are new approaches needed. *J Coll Physicians Surg Pak*. 2008 May;18(5):324.
6. Rao NA, Irfan M, Hussain SJ. Primary drug resistance against Mycobacterium tuberculosis in Karachi. *J Pak Med Assoc*. 2008 Mar;58(3):122-5.
7. Ullah K, Khan B, Raza S, Ahmed P, Satti TM, Butt T, Tariq WZ, Kamal MK. Bone marrow transplant cure for beta-thalassaemia major: initial experience from a developing country. *Ann Hematol*. 2008 Aug;87(8):655-61. Epub 2008 May 6.
8. Aurangzeb S, Badshah M, Khan RS. Chest radiographic findings in neurotuberculosis without pulmonary signs and symptoms. *J Coll Physicians Surg Pak*. 2008 Jan;18(1):27-30.
9. Zaka-Ur-Rehman Z, Jamshaid M, Chaudhry A. Clinical evaluation and monitoring of adverse effects for fixed multidose combination against single drug therapy in pulmonary tuberculosis patients. *Pak J Pharm Sci*. 2008 Apr;21(2):185-94.
10. Javaid A, Hasan R, Zafar A, Ghafoor A, Pathan AJ, Rab A, Sadiq A, Akram CM, Burki I, Shah K, Ansari M, Rizvi N, Khan SU, Awan SR, Syed ZA, Iqbal ZH, Shaheen Z, ur Rehman N. Prevalence of primary multidrug resistance to anti-tuberculosis drugs in Pakistan. *Int J Tuberc Lung Dis*. 2008 Mar;12(3):326-31. Erratum in: *Int J Tuberc Lung Dis*. 2008 Jul;12(7):824.
11. Ullah K, Ahmed P, Raza S, Satti T, Nisa Q, Mirza S, Akhtar F, Kamal MK, Akhtar FM. Allogeneic stem cell transplantation in hematological disorders: single center experience from Pakistan. *Transplant Proc*. 2007 Dec;39(10):3347-57.
12. Ullah K, Raza S, Ahmed P, Satti TM, Ikram A, Chaudhry QU, Kamal MK, Akhtar FM. Pulmonary tuberculosis in allogeneic stem cell transplant recipients. *J Pak Med Assoc*. 2007 Nov;57(11):567-9.
13. Hussain R, Talat N, Shahid F, Dawood G. Longitudinal tracking of cytokines

38. Khan H, Pervez S. Coexistence of caseating granulomas with Hodgkin's lymphoma: a diagnostic and clinical dilemma. *J Coll Physicians Surg Pak.* 2006 Aug;16(8):540-2.
39. Wasay M, Arif H, Khealani B, Ahsan H. Neuroimaging of tuberculous myelitis: analysis of ten cases and review of literature. *J Neuroimaging.* 2006 Jul;16(3):197-205.
40. Khushk IA, Ahmed I, Shah SS. Tuberculosis control in Pakistan: current issues and challenges. *J Coll Physicians Surg Pak.* 2006 Jun;16(6):387-8. No abstract available.
41. Sheikh S, Fatimi SH. Aspergilloma in a patient with no previous history of chronic lung disease. *J Ayub Med Coll Abbottabad.* 2006 Jan-Mar;18(1):62-3.
42. Ahmed R, Sultan F. Granulomatous mastitis: a review of 14 cases. *J Ayub Med Coll Abbottabad.* 2006 Jan-Mar;18(1):52-4.
43. Khan JA, Irfan M, Zaki A, Beg M, Hussain SF, Rizvi N. Knowledge, attitude and misconceptions regarding tuberculosis in Pakistani patients. *J Pak Med Assoc.* 2006 May;56(5):211-4.
44. Habib F, Baig L. Cost of DOTS for tuberculous patients. *J Pak Med Assoc.* 2006 May;56(5):207-10.
45. Akhtar S, Carpenter TE, Rathi SK. A chain-binomial model for intra-household spread of *Mycobacterium tuberculosis* in a low socio-economic setting in Pakistan. *Epidemiol Infect.* 2007 Jan;135(1):27-33. Epub 2006 Jun 2.
46. Barreiro LB, Quach H, Krahenbuhl J, Khaliq S, Mohyuddin A, Mehdi SQ, Gicquel B, Neyrolles O, Quintana-Murci L. DC-SIGN interacts with *Mycobacterium leprae* but sequence variation in this lectin is not associated with leprosy in the Pakistani population. *Hum Immunol.* 2006 Jan-Feb;67(1-2):102-7. Epub 2006 Apr 5.
47. Hasan Z, Tanveer M, Kanji A, Hasan Q, Ghebremichael S, Hasan R. Spoligotyping of *Mycobacterium tuberculosis* isolates from Pakistan reveals predominance of Central Asian Strain 1 and Beijing isolates. *J Clin Microbiol.* 2006 May;44(5):1763-8.
48. Tanoli ZM, Rai ME, Gandapur AS. Clinical presentation and management of visceral leishmaniasis. *J Ayub Med Coll Abbottabad.* 2005 Oct-Dec;17(4):51-3.
49. Khan JA, Akbani F, Malik A, Kazi GN, Aslam F, Hussain SF. Effect of providing free sputum microscopy service to private practitioners on case notification to National Tuberculosis Control Program. *J Ayub Med Coll Abbottabad.* 2005 Oct-Dec;17(4):31-5.
50. Nazir Z, Qazi SH. Bacillus Calmette-Guerin (BCG) lymphadenitis-changing trends and management. *J Ayub Med Coll Abbottabad.* 2005 Oct-Dec;17(4):16-8.
51. Siddiqi K, Walley J, Khan MA, Shah K, Safdar N. Clinical guidelines to diagnose smear-negative pulmonary tuberculosis in Pakistan, a country with low-HIV prevalence. *Trop Med Int Health.* 2006 Mar;11(3):323-31.
52. Hasan Z, Jamil B, Zaidi I, Zafar S, Khan AA, Hussain R. Elevated serum CCL2 concomitant with a reduced mycobacterium-induced response leads to disease dissemination in leprosy. *Scand J Immunol.* 2006 Mar;63(3):241-7.
53. Ashraf O. Hemoptysis, a developing world perspective. *BMC Pulm Med.* 2006 Jan 13;6:1.
54. Ahmed P, Anwar M, Khan B, Altaf C, Ullah K, Raza S, Hussain I. Role of isoniazid prophylaxis for prevention of tuberculosis in haemopoietic stem cell transplant recipients. *J Pak Med Assoc.* 2005 Sep;55(9):378-81.
55. Khan MA, Walley JD, Witter SN, Shah SK, Javeed S. Tuberculosis patient adherence to direct observation: results of a social study in Pakistan. *Health Policy Plan.* 2005 Nov;20(6):354-65. Epub 2005 Sep 23.
56. Mehnaz A, Arif F. Applicability of scoring chart in the early detection of tuberculosis in children. *J Coll Physicians Surg Pak.* 2005 Sep;15(9):543-6.
57. Shah N, Khan NH. Ectopic pregnancy: presentation and risk factors. *J Coll Physicians Surg Pak.* 2005 Sep;15(9):535-8.
58. Kothari A, Mahadevan N, Girling J. Tuberculosis and pregnancy--Results of a study in a high prevalence area in London. *Eur J Obstet Gynecol Reprod Biol.* 2006 May 1;126(1):48-55. Epub 2005 Sep 9.
59. Khan JA, Zahid S, Khan R, Hussain SF, Rizvi N, Rab A, Javed A, Ahmad A, Ait-Khaled N, Enarson DA. Medical interns knowledge of TB in Pakistan. *Trop Doct.* 2005 Jul;35(3):144-7.
60. Waqar SH, Malik ZI, Zahid MA. Isolated appendicular tuberculosis. *J Ayub Med Coll Abbottabad.* 2005 Apr-Jun;17(2):88-9.
61. Ally SH, Ahmed A, Hanif R. An audit of serological tests carried out at clinical laboratory of Ayub Teaching Hospital, Abbottabad. *J Ayub Med Coll Abbottabad.* 2005 Apr-Jun;17(2):75-8.
62. Anis-ur-Rehman, Idris M. Comparison of Mantoux's test with diagnostic BCG in pediatric patients with pulmonary tuberculosis. *J Ayub Med Coll Abbottabad.* 2005 Apr-Jun;17(2):6-8.
63. Hasan Z, Zaidi I, Jamil B, Khan MA, Kanji A, Hussain R. Elevated ex vivo monocyte chemotactic protein-1 (CCL2) in pulmonary as compared with extra-pulmonary tuberculosis. *BMC Immunol.* 2005 Jul 7;6:14.
64. Khan SJ, Anjum Q, Khan NU, Nabi FG. Awareness about common diseases in selected female college students of Karachi. *J Pak Med Assoc.* 2005 May;55(5):195-8.
65. Khan N, Wazir MS, Yasin M, Mohammad J, Javed A. Etiology, presentation and management outcome of pneumothorax. *J Ayub Med Coll Abbottabad.* 2005 Jan-Mar;17(1):62-4.
66. Shehzadi R, Irfan M, Zohra T, Khan JA, Hussain SF. Knowledge regarding management of tuberculosis among general practitioners in northern areas of Pakistan. *J Pak Med Assoc.* 2005 Apr;55(4):174-6.
67. Hussain A, Mirza Z, Qureshi FA, Hafeez A. Adherence of private practitioners with the National Tuberculosis Treatment Guidelines in Pakistan: a survey report. *J Pak Med Assoc.* 2005 Jan;55(1):17-9.
68. Yasmeen N, Kanjee A. Cutaneous tuberculosis: a three year prospective study. *J Pak Med Assoc.* 2005 Jan;55(1):10-2.
69. Phulpoto MA, Qayyum S, Rizvi N, Khuhawar SM. Diagnostic yield of fast plaque TB test for rapid detection of *Mycobacterium tuberculosis* suspects. *J Pak Med Assoc.* 2005 Feb;55(2):57-60.
70. Baskota DK, Prasad R, Sinha BK, Amatya RC. Frequency and effective treatment of ulcers and sinuses in cases of tuberculous cervical lymphadenitis. *J Coll Physicians Surg Pak.* 2005 Mar;15(3):157-9.
71. Farah MG, Meyer HE, Selmer R, Heldal E, Bjune G. Long-term risk of tuberculosis among immigrants in Norway. *Int J Epidemiol.* 2005 Oct;34(5):1005-11. Epub 2005 Mar 31.
72. Azam M, Bhatti N. Intracranial tuberculomas and caries spine: an experience from Children's Hospital Islamabad. *J Ayub Med Coll Abbottabad.* 2004 Oct-Dec;16(4):7-11.
73. Rövekamp BT, van der Linde K, Dees J, Overbeek SE, van Blankenstein M, Kuipers EJ. A solitary tuberculous ulcer in the oesophagus. *Eur J Gastroenterol Hepatol.* 2005 Apr;17(4):435-9.
74. Aslam F, Bhailla I, Nadeem N, Fadoo Z. Salmonella typhi-infected lung hydatid cyst. *Pediatr Infect Dis J.* 2005 Mar;24(3):270-2.
75. Shah SK, Sadiq H, Khalil M, Noor A, Rasheed G, Shah SM, Ahmad N. Do private doctors follow national guidelines for managing pulmonary tuberculosis in Pakistan? *East Mediterr Health J.* 2003 Jul;9(4):776-88.
76. Khan J, Malik A, Hussain H, Ali NK, Akbani F, Hussain SJ, Kazi GN, Hussain SF. Tuberculosis diagnosis and treatment practices of private physicians in Karachi, Pakistan. *East Mediterr Health J.* 2003 Jul;9(4):769-75.
77. Agboatwalla M, Kazi GN, Shah SK, Tariq M. Gender perspectives on knowledge and practices regarding tuberculosis in urban and rural areas in Pakistan. *East Mediterr Health J.* 2003 Jul;9(4):732-40.
78. Shah SA, Mujeeb SA, Mirza A, Nabi KG, Siddiqui Q. Prevalence of pulmonary tuberculosis in Karachi juvenile jail, Pakistan. *East Mediterr Health J.* 2003 Jul;9(4):667-74.
79. Khan B, Ahmed P, Ullah K, Hussain CA, Hussain I, Raza S. Frequency of tuberculosis in haematological malignancies and stem cell transplant recipients. *J Coll Physicians Surg Pak.* 2005 Jan;15(1):30-3.
80. Butt T, Ahmad RN, Kazmi SY, Afzal RK, Mahmood A. An update on the diagnosis of tuberculosis. *J Coll Physicians Surg Pak.* 2003 Dec;13(12):728-34.
81. Khadim MK, Sarfaraz J, Masud TI. Factors affecting tuberculosis control: decision-making at the household level. *J Coll Physicians Surg Pak.* 2003 Dec;13(12):697-700.
82. Sohail S. Socio-economic and diagnostic aspects of tuberculosis in Pakistan. *J Coll Physicians Surg Pak.* 2003 Dec;13(12):677-8. No abstract available.
83. Hashmi KU, Khan B, Ahmed P, Hussain I, Rasul S, Hanif E, Naeem M, Iqbal H, Malik HS. Allogeneic bone marrow transplantation in beta-thalassaemia--single centre study. *J Pak Med Assoc.* 2004 Oct;54(10):499-503.
84. Zaidi AK. Childhood tuberculosis in developing countries: prospects for improved diagnosis and control. *Ceylon Med J.* 2004 Sep;49(3):76-8.
85. Butt T, Ahmad RN, Kazmi SY, Rafi N. Multi-drug resistant tuberculosis in Northern Pakistan. *J Pak Med Assoc.* 2004 Sep;54(9):469-72.
86. Rao NA. Prevalence of pulmonary tuberculosis in Karachi central prison. *J Pak Med Assoc.* 2004 Aug;54(8):413-5.
87. Qidwai W, Rehman S. A young man with hoarseness of voice. *J Ayub Med Coll Abbottabad.* 2004 Apr-Jun;16(2):73-4.

88. Khan N, Mian I, Zia-Ullah, Muhammad J. Performance of ICT-TB test in the detection of pulmonary and extra-pulmonary tuberculosis. *J Ayub Med Coll Abbottabad*. 2004 Apr-Jun;16(2):55-6.
89. Nasir KK, Mansoor F, Khan IM, Ayaz-bin-Zafar, Ali S, Ahmad J. Effectiveness of combined thoracic epidural and light general anaesthesia in patients undergoing non-cardiac thoracic surgery. *J Ayub Med Coll Abbottabad*. 2004 Apr-Jun;16(2):38-41.
90. Ahmed Z, Yaqoob N, Muzaffar S, Kayani N, Pervez S, Hasan SH. Diagnostic surgical pathology: the importance of second opinion in a developing country. *J Pak Med Assoc*. 2004 Jun;54(6):306-11.
91. Shamsi TS, Irfan M, Ansari SH, Farzana T, Khalid MZ, Panjwani VK, Baig MI, Shakoor N. Allogeneic peripheral blood stem cell transplantation in patients with haematological malignancies. *J Coll Physicians Surg Pak*. 2004 Sep;14(9):522-6.
92. Islam N, Ahmedani MY. Cervical spine tuberculosis. *J Coll Physicians Surg Pak*. 2004 Aug;14(8):499-500.
93. Moiz B. Comparative study of Mantoux test versus BCG inoculation as a diagnostic tool for pulmonary tuberculosis in children up to 5 years of age. *J Coll Physicians Surg Pak*. 2004 Jul;14(7):449-50; author reply 450.
94. Jadoon SM, Moin S, Ahmed TA, Bashir MM, Jadoon S. Smear-negative pulmonary tuberculosis and lymphocyte subsets. *J Coll Physicians Surg Pak*. 2004 Jul;14(7):419-22.
95. Butt T, Ahmad RN, Kazmi SY, Mahmood A. Rapid diagnosis of pulmonary tuberculosis by mycobacteriophage assay. *Int J Tuberc Lung Dis*. 2004 Jul;8(7):899-902.
96. Islam A. Health-related millennium development goals: policy challenges for Pakistan. *J Pak Med Assoc*. 2004 Apr;54(4):175-81.
97. Nawaz G, Khan MR. Primary sinonasal tuberculosis in north-west Pakistan. *J Coll Physicians Surg Pak*. 2004 Apr;14(4):221-4.
98. Begum S, Hassan SI, Siddiqui BS. Synthesis and antimycobacterial activity of some beta-carboline alkaloids. *Nat Prod Res*. 2004 Aug;18(4):341-7.
99. Hussain SF, Irfan M, Abbasi M, Anwer SS, Davidson S, Haqqee R, Khan JA, Islam M. Clinical characteristics of 110 military tuberculosis patients from a low HIV prevalence country. *Int J Tuberc Lung Dis*. 2004 Apr;8(4):493-9.
100. Thakurdas SM, Hasan Z, Hussain R. IgG1 antimycobacterial antibodies can reverse the inhibitory effect of pentoxifylline on tumour necrosis factor alpha (TNF-alpha) secreted by mycobacterial antigen-stimulated adherent cells. *Clin Exp Immunol*. 2004 May;136(2):320-7.
101. Zaidi AK, Awasthi S, deSilva HJ. Burden of infectious diseases in South Asia. *BMJ*. 2004 Apr 3;328(7443):811-5.
102. Hussain R, Shahid F, Zafar S, Dojki M, Dockrell HM. Immune profiling of leprosy and tuberculosis patients to 15-mer peptides of *Mycobacterium leprae* and *M. tuberculosis* GroES in a BCG vaccinated area: implications for development of vaccine and diagnostic reagents. *Immunology*. 2004 Apr;111(4):462-71.
103. Siddiqui K, Nazir Z, Ali SS, Pervaiz S. Is routine histological evaluation of pediatric hernial sac necessary? *Pediatr Surg Int*. 2004 Feb;20(2):133-5. Epub 2004 Feb 25.
104. Razzag AA, Ahmed S. Resolution of intracranial tuberculoma with medical therapy. *J Pak Med Assoc*. 2003 Nov;53(11):569-70.
105. Mirza S, Restrepo BI, McCormick JB, Fisher-Hoch SP. Diagnosis of tuberculosis lymphadenitis using a polymerase chain reaction on peripheral blood mononuclear cells. *Am J Trop Med Hyg*. 2003 Nov;69(5):461-5.
106. García de Olalla P, Caylà JA, Milá C, Jansà JM, Badosa I, Ferrer A, Ros M, Gómez i Prat J, Armengou JM, Alonso E, Alcaide J. Tuberculosis screening among immigrants holding a hunger strike in churches. *Int J Tuberc Lung Dis*. 2003 Dec;7(12 Suppl 3):S412-6.
107. Ali SS, Rabbani F, Siddiqui UN, Zaidi AH, Sophie A, Virani SJ, Younus NA. Tuberculosis: do we know enough? A study of patients and their families in an out-patient hospital setting in Karachi, Pakistan. *Int J Tuberc Lung Dis*. 2003 Nov;7(11):1052-8.
108. Memon GA, Khushk IA. Primary tuberculosis of tongue. *J Coll Physicians Surg Pak*. 2003 Oct;13(10):604-5.
109. White MC. Commentary: Evaluating the tuberculosis burden in prisoners in Pakistan. *Int J Epidemiol*. 2003 Oct;32(5):799-801.
110. Hussain H, Akhtar S, Nanan D. Prevalence of and risk factors associated with *Mycobacterium tuberculosis* infection in prisoners, North West Frontier Province, Pakistan. *Int J Epidemiol*. 2003 Oct;32(5):794-9.
111. Khan S, Javaid A, Ghorri RA, Mahmood K, Anwer N, Khan SU, Iqbal ZH, Rahman F, Ullah S, Imran K, Akhter N, Khan MK, Siddiqui SJ, Fareed A, Khan MH. Cefaclor AF vs Clarithromycin in acute exacerbation of chronic bronchitis (B3M-PK-AJBG). *J Pak Med Assoc*. 2003 Aug;53(8):338-45.
112. Israr SM. Is Ministry of Health fully prepared to implement an effective DOTS program in Pakistan? An operations research on TB control program in the public health sector in Sindh. *J Pak Med Assoc*. 2003 Aug;53(8):324-7.
113. Rizvi N, Shah RH, Inayat N, Hussain N. Differences in clinical presentation of pulmonary tuberculosis in association with age. *J Pak Med Assoc*. 2003 Aug;53(8):321-4.
114. Khan JA, Malik A. Tuberculosis in Pakistan: are we losing the battle? *J Pak Med Assoc*. 2003 Aug;53(8):320-1.
115. Akbar M. Strictureplasty in tuberculous small bowel strictures. *J Ayub Med Coll Abbottabad*. 2003 Apr-Jun;15(2):37-40.
116. Hasan Z, Shah BH, Mahmood A, Young DB, Hussain R. The effect of mycobacterial virulence and viability on MAP kinase signalling and TNF alpha production by human monocytes. *Tuberculosis (Edinb)*. 2003;83(5):299-309.
117. Tariq P. Assessment of coverage levels of single dose measles vaccine. *J Coll Physicians Surg Pak*. 2003 Sep;13(9):507-10.
118. Wasay M, Kheleani BA, Moolani MK, Zaheer J, Pui M, Hasan S, Muzaffar S, Bakshi R, Sarawari AR. Brain CT and MRI findings in 100 consecutive patients with intracranial tuberculoma. *J Neuroimaging*. 2003 Jul;13(3):240-7.
119. Pope DS, Chaisson RE. TB treatment: as simple as DOT? *Int J Tuberc Lung Dis*. 2003 Jul;7(7):611-5.
120. Rizvi SA, Naqvi SA, Hussain Z, Hashmi A, Akhtar F, Hussain M, Ahmed E, Zafar MN, Hafiz S, Muzaffar R, Jawad F. Renal transplantation in developing countries. *Kidney Int Suppl*. 2003 Feb;(83):S96-100.
121. Moorani KN, Khan KM, Ramzan A. Infections in children with nephrotic syndrome. *J Coll Physicians Surg Pak*. 2003 Jun;13(6):337-9.
122. Dye C, Watt CJ, Bleed DM, Williams BG. What is the limit to case detection under the DOTS strategy for tuberculosis control? *Tuberculosis (Edinb)*. 2003;83(1-3):35-43.
123. Abid S, Jafri W, Hamid S, Khan H, Hussain A. Endoscopic features of esophageal tuberculosis. *Gastrointest Endosc*. 2003 May;57(6):759-62.
124. Ibrahim KM, Khan S, Laaser U. Tuberculosis control: current status, challenges and barriers ahead in 22 high endemic countries. *J Ayub Med Coll Abbottabad*. 2002 Oct-Dec;14(4):11-5.
125. Khan JA, Hussain SF. Anti-tuberculous drug prescribing: doctors' compliance at a private teaching hospital in Pakistan. *Trop Doct*. 2003 Apr;33(2):94-6.
126. Majeed SK, Ghazanfar A, Ashraf J. Caecal amoeboma simulating malignant neoplasia, ileocaecal tuberculosis and Crohn's disease. *J Coll Physicians Surg Pak*. 2003 Feb;13(2):116-7.
127. Dale JW, Al-Ghusein H, Al-Hashmi S, Butcher P, Dickens AL, Drobniwski F, Forbes KJ, Gillespie SH, Lamprecht D, McHugh TD, Pitman R, Rastogi N, Smith AT, Sola C, Yesilkaya H. Evolutionary relationships among strains of *Mycobacterium tuberculosis* with few copies of IS6110. *J Bacteriol*. 2003 Apr;185(8):2555-62.
128. Farah MG, Tverdal A, Selmer R, Heldal E, Bjune G. Tuberculosis in Norway by country of birth, 1986-1999. *Int J Tuberc Lung Dis*. 2003 Mar;7(3):232-5.
129. Smego RA, Ahmed N. A systematic review of the adjunctive use of systemic corticosteroids for pulmonary tuberculosis. *Int J Tuberc Lung Dis*. 2003 Mar;7(3):208-13.
130. Khan IM, Khan S, Laaser U. Tuberculous meningitis: a disease of fatal outcome in children. *Eur J Pediatr*. 2003 Apr;162(4):281-2. Epub 2003 Feb 21.
131. Rao NA, Sadiq MA. Recent trend in the radiological presentation of pulmonary tuberculosis in Pakistani adults. *J Pak Med Assoc*. 2002 Nov;52(11):501-3.
132. Burki T, Amanullah A, Rehman AU, Ali MN. Late presentation of Bochdalek hernia with intestinal symptoms. *J Ayub Med Coll Abbottabad*. 2002 Jul-Sep;14(3):27-8.
133. Ali NS, Hussain SF, Azam SI. Is there a value of mantoux test and erythrocyte sedimentation rate in pre-employment screening of health care workers for tuberculosis in a high prevalence country? *Int J Tuberc Lung Dis*. 2002 Nov;6(11):1012-6.
134. Awan MS, Salahuddin I. Tuberculous otitis media: two case reports and literature review. *Ear Nose Throat J*. 2002 Nov;81(11):792-4.
135. Rathi SK, Akhtar S, Rahbar MH, Azam SI. Prevalence and risk factors associated with tuberculin skin test positivity among household contacts of smear-positive pulmonary tuberculosis cases in Umerkot, Pakistan. *Int J Tuberc Lung Dis*. 2002 Oct;6(10):851-7.
136. Meulemans H, Mortelmans D, Liefvooghe R, Mertens P, Zaidi SA, Solangi MF,

- De Muynck A. The limits to patient compliance with directly observed therapy for tuberculosis: a socio-medical study in Pakistan. *Int J Health Plann Manage.* 2002 Jul-Sep;17(3):249-67.
137. Ullah S, Shah SH, Rehman AU, Kamal A, Begum N. Tuberculous lymphadenitis in Afghan refugees. *J Ayub Med Coll Abbottabad.* 2002 Apr-Jun;14(2):22-3.
138. Hussain R, Kaleem A, Shahid F, Djoki M, Jamil B, Mehmood H, Dawood G, Dockrell HM. Cytokine profiles using whole-blood assays can discriminate between tuberculosis patients and healthy endemic controls in a BCG-vaccinated population. *J Immunol Methods.* 2002 Jun 1;264(1-2):95-108.
139. Khan IM, Yassin KM, Hurrelmann K, Laaser U. Urging health system research: identifying gaps and fortifying tuberculosis control in Pakistan. *Croat Med J.* 2002 Aug;43(4):480-4.
140. Qureshi HU, Merwat SN, Nawaz SA, Rana AA, Malik A, Mahmud MK, Latif A, Khan A, Sarwari AR. Predictors of inpatient mortality in 190 adult patients with tuberculous meningitis. *J Pak Med Assoc.* 2002 Apr;52(4):159-63.
141. Muzaffar R, Batool S, Aziz F, Naqvi A, Rizvi A. Evaluation of the FASTPlaqueTB assay for direct detection of Mycobacterium tuberculosis in sputum specimens. *Int J Tuberc Lung Dis.* 2002 Jul;6(7):635-40.
142. Gascayne-Binzi DM, Barlow RE, Essex A, Gelletlie R, Khan MA, Hafiz S, Collins TA, Frizzell R, Hawkey PM. Predominant VNTR family of strains of Mycobacterium tuberculosis isolated from South Asian patients. *Int J Tuberc Lung Dis.* 2002 Jun;6(6):492-6.
143. Ibrahim KM, Laaser U. Resistance and refugees in Pakistan: challenges ahead in tuberculosis control. *Lancet Infect Dis.* 2002 May;2(5):270-2.
144. Aziz R, Khan AR, Qayum I, ul Mannan M, Khan MT, Khan N. Presentation of pulmonary tuberculosis at Ayub Teaching Hospital Abbottabad. *J Ayub Med Coll Abbottabad.* 2002 Jan-Mar;14(1):6-9.
145. Bhutto AM, Solangi A, Khaskhely NM, Arakaki H, Nonaka S. Clinical and epidemiological observations of cutaneous tuberculosis in Larkana, Pakistan. *Int J Dermatol.* 2002 Mar;41(3):159-65.
146. Khan MA, Walley JD, Witter SN, Imran A, Safdar N. Costs and cost-effectiveness of different DOT strategies for the treatment of tuberculosis in Pakistan. *Directly Observed Treatment. Health Policy Plan.* 2002 Jun;17(2):178-86.
147. Rizvi SA, Naqvi SA, Hussain Z, Hashmi A, Akhtar F, Zafar MN, Hussain M, Ahmed E, Kazi JI, Hasan AS, Khalid R, Aziz S, Sultan S. Living-related pediatric renal transplants: a single-center experience from a developing country. *Pediatr Transplant.* 2002 Apr;6(2):101-10.
148. Brahmabhatt S, Hussain R, Zafar S, Dawood G, Ottenhoff TH, Drijfhout JW, Bothamley G, Smith S, Lopez FV, Dockrell HM. Human T cell responses to peptides of the Mycobacterium leprae 45-kD serine-rich antigen. *Clin Exp Immunol.* 2002 Apr;128(1):140-8.
149. Pui MH, Ahmad MN. Magnetization transfer imaging diagnosis of intracranial tuberculomas. *Neuroradiology.* 2002 Mar;44(3):210-5.
150. Hussain R. Lay perceptions of genetic risks attributable to inbreeding in Pakistan. *Am J Hum Biol.* 2002 Mar-Apr;14(2):264-74.
151. Khan IM, Laaser U. Burden of tuberculosis in Afghanistan: update on a war-stricken country. *Croat Med J.* 2002 Apr;43(2):245-7.
152. Strauss RM, Townsend R, Green ST, Prakasam SF, Read RC, Mohsen AH. Peritoneal tuberculosis and elevated serum CA 125 levels: recognizing the association is important. *J Infect.* 2001 Nov;43(4):256-7.
153. Avan BI, Fatmi Z, Rashid S. Comparison of clinical and laparoscopic features of infertile women suffering from genital tuberculosis (TB) or pelvic inflammatory disease (PID) or endometriosis. *J Pak Med Assoc.* 2001 Nov;51(11):393-9.
154. Khuhawar MY, Rind FM. Liquid chromatographic determination of isoniazid, pyrazinamide and rifampicin from pharmaceutical preparations and blood. *J Chromatogr B Analyt Technol Biomed Life Sci.* 2002 Jan 25;766(2):357-63.
155. Khan MR, Khan IR, Pal KM. Diagnostic issues in abdominal tuberculosis. *J Pak Med Assoc.* 2001 Apr;51(4):138-42.
156. Hussain SF. Drug resistant TB. *J Pak Med Assoc.* 2001 Apr;51(4):137-8.
157. Picard C, Fieschi C, Altare F, Al-Jumaah S, Al-Hajjar S, Feinberg J, Dupuis S, Soudais C, Al-Mohsen IZ, Génin E, Lammass D, Kumararatne DS, Leclerc T, Rafii A, Frayha H, Murugasu B, Wah LB, Sinniah R, Loubser M, Okamoto E, Al-Ghoniaim A, Tufenkeji H, Abel L, Casanova JL. Inherited interleukin-12 deficiency: IL12B genotype and clinical phenotype of 13 patients from six kindreds. *Am J Hum Genet.* 2002 Feb;70(2):336-48. Epub 2001 Dec 17.
158. Rizvi N, Hussain M. Survey of knowledge about tuberculosis amongst family physicians. *J Pak Med Assoc.* 2001 Sep;51(9):333-7.
159. Ahmad K. Stop TB partnership to focus on Afghanistan and Pakistan. *Lancet.* 2001 Oct 27;358(9291):1434.
160. Davies PD. TB at the end of the 20th century. *Thorax.* 2001 Nov;56(11):897.
161. Ormerod LP, Green RM, Gray S. Are there still effects on Indian Subcontinent ethnic tuberculosis of return visits?: a longitudinal study 1978-97. *J Infect.* 2001 Aug;43(2):132-4.
162. Moulding TS. Direct observation for tuberculosis treatment. *Lancet.* 2001 Aug 4;358(9279):422.
163. Khan JA, Akhtar S, Fayyaz Hussain S. Direct observation for tuberculosis treatment. *Lancet.* 2001 Aug 4;358(9279):421; author reply 421-2.
164. Maher D, Raviglione M, Lee JW. Direct observation for tuberculosis treatment. *Lancet.* 2001 Aug 4;358(9279):421; author reply 421-2.
165. Karam Shah S. Direct observation for tuberculosis treatment. *Lancet.* 2001 Aug 4;358(9279):420-1; author reply 421-2.
166. Mahmood A. Multi-drug resistant tuberculosis. *J Pak Med Assoc.* 2001 May;51(5):204-5.
167. Muynck AD. Tuberculosis at the start of the new millennium: can we fight this plague? *J Pak Med Assoc.* 2001 May;51(5):171-2.
168. Mohapatra PR. Direct observation of tuberculosis treatment. *Lancet.* 2001 May 26;357(9269):1708.
169. Naqvi A, Rizvi A, Hussain Z, Hafeez S, Hashmi A, Akhtar F, Hussain M, Ahmed E, Akhtar S, Muzaffar R, Naqvi R. Developing world perspective of posttransplant tuberculosis: morbidity, mortality, and cost implications. *Transplant Proc.* 2001 Feb-Mar;33(1-2):1787-8.
170. Bennett J, Pitman R, Jarman B, Innes J, Best N, Alves B, Cook A, Hart D, Coker R. A study of the variation in tuberculosis incidence and possible influential variables in Manchester, Liverpool, Birmingham and Cardiff in 1991-1995. *Int J Tuberc Lung Dis.* 2001 Feb;5(2):158-63.
172. De Muynck A, Siddiqi S, Ghaffar A, Sadiq H. Tuberculosis control in Pakistan: critical analysis of its implementation. *J Pak Med Assoc.* 2001 Jan;51(1):41-7. No abstract available.
173. Liefoghe R, Muynck AD. The dynamics of tuberculosis treatment adherence. *J Pak Med Assoc.* 2001 Jan;51(1):3-9.
174. Qureshi RN, Samad S, Hamid R, Lakha SF. Female genital tuberculosis revisited. *J Pak Med Assoc.* 2001 Jan;51(1):16-8.
175. Sadiq H, Muynck AD. Health care seeking behavior of pulmonary tuberculosis patients visiting TB Center Rawalpindi. *J Pak Med Assoc.* 2001 Jan;51(1):10-6.
176. Memon AM. Tuberculosis. *J Pak Med Assoc.* 2001 Jan;51(1):1.
177. Walley JD, Khan MA, Newell JN, Khan MH. Effectiveness of the direct observation component of DOTS for tuberculosis: a randomised controlled trial in Pakistan. *Lancet.* 2001 Mar 3;357(9257):664-9.
178. Pui MH, Memon WA. Magnetic resonance imaging findings in tuberculous meningoencephalitis. *Can Assoc Radiol J.* 2001 Feb;52(1):43-9.
179. Dockrell HM, Brahmabhatt S, Robertson BD, Britton S, Fruth U, Gebre N, Hunegnaw M, Hussain R, Manadhar R, Murrillo L, Pessolani MC, Roche P, Salgado JL, Sampaio E, Shahid F, Thole JE, Young DB. Diagnostic assays for leprosy based on T-cell epitopes. *Lepr Rev.* 2000 Dec;71 Suppl:S55-8; discussion S58-9.
180. Hussain R, Shiratsuchi H, Phillips M, Ellner J, Wallis RS. Opsonizing antibodies (IgG1) up-regulate monocyte proinflammatory cytokines tumour necrosis factor-alpha (TNF-alpha) and IL-6 but not anti-inflammatory cytokine IL-10 in mycobacterial antigen-stimulated monocytes-implications for pathogenesis. *Clin Exp Immunol.* 2001 Feb;123(2):210-8.
181. Marsh DR, Kadir MM, Husein K, Luby SP, Siddiqui R, Khalid SB. Adult mortality in slums of Karachi, Pakistan. *J Pak Med Assoc.* 2000 Sep;50(9):300-6.
182. Walley J, Newell J, Khan A. Directly observed therapy and treatment adherence. *Lancet.* 2000 Sep 16;356(9234):1031; author reply 1032.
183. Buchholz NP, Salahuddin S, Haque R. Genitourinary tuberculosis: a profile of 55 in-patients. *J Pak Med Assoc.* 2000 Aug;50(8):265-9.
184. Dockrell HM, Brahmabhatt S, Robertson BD, Britton S, Fruth U, Gebre N, Hunegnaw M, Hussain R, Manadhar R, Murrillo L, Pessolani MC, Roche P, Salgado JL, Sampaio E, Shahid F, Thole JE, Young DB. A postgenomic approach to identification of Mycobacterium leprae-specific peptides as T-cell reagents. *Infect Immun.* 2000 Oct;68(10):5846-55.
185. Pui MH. Magnetization transfer analysis of brain tumor, infection, and infarction. *J Magn Reson Imaging.* 2000 Sep;12(3):395-9.
186. Ur-Rahman N, Jamjoom ZA, Jamjoom A. Spinal aspergillosis in onimmunocompromised host mimicking Pott's paraplegia. *Neurosurg Rev.* 2000

- Jun;23(2):107-11.
187. Vangen S, Stollenberg C, Stray-Pedersen B. Complaints and complications in pregnancy: a study of ethnic Norwegian and ethnic Pakistani women in Oslo. *Ethn Health*. 1999 Feb-May;4(1-2):19-28.
 188. Naqvi SA. The challenge of posttransplant tuberculosis. *Transplant Proc*. 2000 May;32(3):650-1.
 189. Brown P. Drug resistant tuberculosis can be controlled, says WHO. *BMJ*. 2000 Mar 25;320(7238):821.
 190. Rizvi N, Rao NA, Hussain M. Yield of gastric lavage and bronchial wash in pulmonary tuberculosis. *Int J Tuberc Lung Dis*. 2000 Feb;4(2):147-51.
 191. Hussain R, Shiratsuchi H, Ellner JJ, Wallis RS. PPD-specific IgG1 antibody subclass upregulate tumour necrosis factor expression in PPD-stimulated monocytes: possible link with disease pathogenesis in tuberculosis. *Clin Exp Immunol*. 2000 Mar;119(3):449-55.
 192. Hussain SF, Aziz A, Fatima H. Pneumothorax: a review of 146 adult cases admitted at a university teaching hospital in Pakistan. *J Pak Med Assoc*. 1999 Oct;49(10):243-6.
 193. Khan A, Walley J, Newell J, Imdad N. Tuberculosis in Pakistan: socio-cultural constraints and opportunities in treatment. *Soc Sci Med*. 2000 Jan;50(2):247-54.
 194. Liefoghe R, Suetens C, Meulemans H, Moran MB, De Muynck A. A randomised trial of the impact of counselling on treatment adherence of tuberculosis patients in Sialkot, Pakistan. *Int J Tuberc Lung Dis*. 1999 Dec;3(12):1073-80.
 195. Islam M, Mitra AK, Mian AH, Vermund SH. HIV/AIDS in Bangladesh: a national surveillance. *Int J STD AIDS*. 1999 Jul;10(7):471-4.
 196. Hussain R, Dockrell HM, Chiang TJ. Dominant recognition of a cross-reactive B-cell epitope in *Mycobacterium leprae* 10 K antigen by immunoglobulin G1 antibodies across the disease spectrum in leprosy. *Immunology*. 1999 Apr;96(4):620-7.
 197. Ahmad M, Ahmed A. Tuberculous peritonitis: fatality associated with delayed diagnosis. *South Med J*. 1999 Apr;92(4):406-8.
 198. Netto EM, Dye C, Raviglione MC. Progress in global tuberculosis control 1995-1996, with emphasis on 22 high-incidence countries. Global Monitoring and Surveillance Project. *Int J Tuberc Lung Dis*. 1999 Apr;3(4):310-20.
 199. Kakakhel K. Simultaneous occurrence of tuberculous gumma, tuberculosis verrucosus cutis, and lichen scrofulosorum. *Int J Dermatol*. 1998 Nov;37(11):867-9.
 200. Alvi AR, Hussain SF, Shah MA, Khalida M, Shamsudin M. Prevalence of pulmonary tuberculosis on the roof of the world. *Int J Tuberc Lung Dis*. 1998 Nov;2(11):909-13.
 201. Hussain R, Dockrell HM, Shahid F, Zafar S, Chiang TJ. Leprosy patients with lepromatous disease recognize cross-reactive T cell epitopes in the *Mycobacterium leprae* 10-kD antigen. *Clin Exp Immunol*. 1998 Nov;114(2):204-9.
 202. Ormerod LP. Is new immigrant screening for tuberculosis still worthwhile? *J Infect*. 1998 Jul;37(1):39-40.
 203. Ahmed M, Aziz S. Pattern of tuberculosis in general practice. *J Pak Med Assoc*. 1998 Jun;48(6):183-4.
 204. Moatter T, Mirza S, Siddiqui MS, Soomro IN. Detection of *Mycobacterium tuberculosis* in paraffin embedded intestinal tissue specimens by polymerase chain reaction: characterization of IS6110 element negative strains. *J Pak Med Assoc*. 1998 Jun;48(6):174-8.
 205. Qazi SA, Khan S, Khan MA. Epidemiology of childhood tuberculosis in a hospital setting. *J Pak Med Assoc*. 1998 Jun;48(6):164-7.
 206. Qazi SA, Khan S, Khan MA. Epidemiology of childhood tuberculosis in a hospital setting. *J Pak Med Assoc*. 1998 Apr;48(4):90-3.
 207. Palmer C. The Taliban's war on women. *Lancet*. 1998 Aug 29;352(9129):734.
 208. Hussain R, Toossi Z, Hasan R, Jamil B, Dawood G, Ellner JJ. Immune response profile in patients with active tuberculosis in a BCG vaccinated area. *Southeast Asian J Trop Med Public Health*. 1997 Dec;28(4):764-73.
 209. Wise J. WHO identifies 16 countries struggling to control tuberculosis. *BMJ*. 1998 Mar 28;316(7136):957. Erratum in: *BMJ* 1998 Apr 11;316(7138):1113.
 210. Qazilbash AA, Bari A. Sero-diagnosis of human brucellosis among TB suspected patients. *J Pak Med Assoc*. 1997 Oct;47(10):243-6.
 211. Arif K, Ali SA, Amanullah S, Siddiqui I, Khan JA, Nayani P. Physician compliance with national tuberculosis treatment guidelines: a university hospital study. *Int J Tuberc Lung Dis*. 1998 Mar;2(3):225-30.
 212. Kumar D, Watson JM, Charlett A, Nicholas S, Darbyshire JH. Tuberculosis in England and Wales in 1993: results of a national survey. Public Health Laboratory Service/British Thoracic Society/Department of Health Collaborative Group. *Thorax*. 1997 Dec;52(12):1060-7.
 213. Moazam F, Nazir Z. Amebic liver abscess: spare the knife but save the child. *J Pediatr Surg*. 1998 Jan;33(1):119-22.
 214. Ormerod LP, McCarthy OR, Paul EA. Changing pattern of respiratory tuberculosis in the UK in adult patients from the Indian subcontinent. *Thorax*. 1997 Sep;52(9):802-4.
 215. Naqvi A, Akhtar F, Naqvi R, Akhtar S, Askari H, Lal M, Bhatti S, Shahzad A, Soomro S, Rizvi A. Problems of diagnosis and treatment of tuberculosis following renal transplantation. *Transplant Proc*. 1997 Nov;29(7):3051-2.
 216. Agboatwalla M, Akram DS. Impact of health education on mothers' knowledge of preventive health practices. *Trop Doct*. 1997 Oct;27(4):199-202.
 217. Siddiqi S, Elahi HA, Hussain M, Khan DA, Beeching NJ. Evaluation of adrenal function in long standing pulmonary tuberculosis: a study of 100 cases. *J Pak Med Assoc*. 1997 May;47(5):132-4.
 218. Yates VM, Ormerod LP. Cutaneous tuberculosis in Blackburn district (U.K.): a 15-year prospective series, 1981-95. *Br J Dermatol*. 1997 Apr;136(4):483-9.