

Therapeutic Injections in Pakistan: from the Patients' Perspective

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Summary

Objective: To investigate the behaviour, knowledge of risks, and attitudes towards injections among patients at a clinic in Karachi.

Methods: In March 1995, trained staff administered a structured questionnaire to 198 consecutive new adult patients attending a university clinic in Karachi, Pakistan.

Results: Half (97; 49%) of the patients received injections at their last visit to a health care provider. 35% had received 10 or more injections in the last year. 64% felt that injections were more powerful and were willing to pay more for them than for pills. 84% preferred pills or advice over injections if told they were equally effective, 83% believed that a used needle could transmit a fatal disease, and 86% believed that it is usually possible to get better without an injection. 91 % reported that the doctor always recommends an injection; few patients (9%) ever asked for one. Injections were given without much regard for the chief complaint of the patient. Some needles (n = 21) for the injection came from bowls of water: of those from closed packets (n = 116), 68 were 'cleaned' by wiping or placing them in water. 91% of patients (180) knew at least one risk of reuse of needles. Patients who knew three or more risks of using unclean needles were 0.14 times as likely to have had more than five injections per year in the last 5 years but only if the patients had 8 or more years of education.

Conclusion: Patients receive injections from doctors in Pakistan frequently, indiscriminately and often without proper safety precautions. They are aware of both positive and negative aspects of injections but are likely to do what the doctor suggests. Interventions to reduce risky overuse of injections should focus on patients' general education and knowledge of the risks of injections to empower them to choose healthier therapies.

Keywords: adverse effects, blood, developing country, drug-therapy, economics, education

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Introduction

Receiving an injection in the course of medical care is an innocuous occurrence for patients in industrialized areas of the world owing to near-universal employment of sterile equipment and practices. Breaches in sterile technique are so rare they are considered reportable (CDC 1993; Mortimer 1995). The situation in the developing world, however, is different: re-use of contaminated needles and/or syringes between patients is commonplace (Piot and Carael 1988; Reeler 1990; Clayton et al. 1993; Gumodoka et al. 1996). This has resulted in the iätrogenic transmission of many serious bloodborne diseases including Human Immunodeficiency Virus (HIV) (Hersh et al. 1993), Hepatitis B Virus (HBV) (Ko et al. 1991; Narendranathan & Philip 1993), Hepatitis C Virus (HCV) (Hayashi et al. 1995; Luby et al. 1997), Lassa fever (Fisher-Hoch et al. 1995), and Ebola virus (Baron et al. 1983). Doctors' knowledge and practices regarding therapeutic injections has been studied in developing countries (Cunningham 1970; Clayton et al. 1993; Gumodoka et al. 1996). The attitudes of patients to injections have been reported for migrant farmworkers in the USA (McVea 1997) and among

Tanzanians (Gumodoka et al. 1996). There are no published data on the views of patients toward needle use in Pakistan, and very little information on this from other places in the developing world (Wyatt 1984; Michel 1985). To stop iatrogenic spread of disease through the re-use of therapeutic injection equipment, we need to understand why people use needles in the first place and what factors are related to increased or decreased needle use. The objective of this study was to describe the attitudes and practice of patients attending a university clinic in Karachi, Pakistan regarding therapeutic injections.

Materials and Methods

Setting

Karachi, Pakistan is a city of 9.8 million people situated on the coast of the Arabian Sea. It is the major port and the economic centre of Pakistan. Some 40% of people live in squatter settlements. There is little to no regulation of health practitioners or pharmacies throughout the country. Many general practitioners have graduated from one of a number of the country's medical schools with a Medicine Bachelor Bachelor of Science (MBBS) degree (the British and Commonwealth equivalent to MD), but it is not uncommon to find former army medics, nurses, dispensers or apprentices practising as 'doctors.' There is no effective enforcement of pharmaceutical regulations so that prescriptions are not required to obtain either medication or injecting equipment. When prescriptions are used they often take the form of a scrap of paper with the name of a drug and some instruction regarding its use, but identification of the patient or the doctor is frequently missing. University physicians, familiar with local practices, described situations where doctors offer special mixtures of injectable medications (for example an antibiotic, mixed with an antimalarial, a steroid and/or vitamin B 12) that can 'only be provided' by that particular doctor. There is virtually no system in Pakistan for the safe and routine destruction of disposable syringes (Steinglass et al. 1995). Instead black marketeers of medical waste repackaged and resell used needles.

The Aga Khan University Hospital and its affiliated clinics, situated in Karachi, have a reputation in the community of providing quality clinical care. The Community Health Center is the least expensive of the university's clinics and attracts relatively poor patients, some of whom travel great distances to be seen. It is often used as a place of last resort for poorer patients in the community unsatisfied by other practitioners.

Procedure

Trained interviewers administered a 140 item questionnaire to consecutive adult (age 18 years or older) patients presenting for the first time to the Community Health Center of the Aga Khan University between March 15 and 30 1995. Questions focused on the patient's last encounter with a health care provider, use of injections over the previous one and five years, knowledge of risks of blood-borne diseases, and attitudes about injections vs. other therapies.

The questionnaire was developed in English, then translated into Urdu and back-translated into English to check for accuracy. Interviewers were Masters level graduates fluent in Urdu and English. They were instructed to ask the questions in Urdu as written. Several patients spoke languages other than Urdu and family members agreed to serve as translators.

Statistical Methods

We compared the proportion of categorical differences between groups by relative risks, used Cornfield's approximation to estimate confidence intervals, and used Yates corrected Chi square test or Fisher exact test where appropriate. We compared the medians of continuous variables that were not distributed normally using a Wilcoxon signed-rank test, and evaluated the potential dose- effect of exposures using the extended Mantel-Haenzel test (Schiesselman 1982). We double-entered all data. We performed statistical analysis using EpiInfo 5.1 (Dean et al. 1990). For ease of reporting, questions that were left unanswered were grouped with 'don't know' responses where reasonable.

Results

During the study period, 205 new adult patients registered at the Community Health Center. After informed consent two patients refused to participate and five could not be located in the bustling clinic by the interviewers. Thus 198 patients were ultimately interviewed. The patients were a mean 37 years of age; 46% were male, and 79% were married. They had a mean of 6.2 years of formal education (range 0-16, median 8) and their median household income category was 2000-4999 Rupees/month (US \$65- 160/month). Mean household size was 8.2 persons.

Quantity of Injection Exposures

At their last health visit, 94% of patients (185) went to someone they identified as a general practitioner (literally, 'doctor', as opposed to 'specialist'). Nearly half (97; 49%) of patients had received at least one injection and 51 % (99) of patients had the visit within one week prior to presenting to the university clinic. Most patients had received numerous injections within the previous one to five years (Table 1).

Table 1. Number of injections per year patients received over the past one and five years. Community Health Center, Aga Khan University, Karachi, Pakistan, 1994.

No. of injections per year	Last one year		Last five years	
	No.	(%)	No.	(%)
0	36	(18)	59	(31)
1	23	(12)	27	(14)
2-4	41	(21)	49	(26)
5-9	26	(13)	35	(18)
10-20	52	(27)	12	(6)
20-40	13	(7)	7	(4)
> 40	4	(2)	1	(1)
Total*	195	(100)	191	(100)

*Totals differ because for some patients' no answer was recorded.

Indeed, a third (69; 35%) had received 10 or more injections in the previous year and 9% (n=17) more than 20 injections. Men were 1.7 times more likely than women to have received an injection at their last visit (64 vs. 36%, relative risk (RR) 1.7, 95% confidence interval (CI) 1.3-2.3) but were not significantly more likely than women to have received five injections or more in the past year (RR 1.09; 95% CI 0.81-1.45). The median time since the last injection was 14 days for men and 45 days for women (Wilcoxon Signed-Rank test $P < 0.04$). Patients with household incomes below the median were more likely to receive five or more injections in the last year (RR 2.0; 95% CI 1.4-3.1).

Patients were no more likely to receive an injection at short (<8 minute) vs. longer visits (RR 1.02; 95% CI 0.77- 1.36). 95% of parents (119/125) stated that when sick, their children were less likely to receive injections than they were.\

Quality of Care

The patient's chief complaint bore little relation to their probability of receiving an injection (Table 2).

Table 2. Reason for last visit to a health practitioner and whether an injection was received then. Community Health Center, Aga Khan University, Karachi, Pakistan, 1994.

Chief complaint at last visit	Frequency (%)	Injection received no. (%)	P-value
Pain	72 (36)	40 (56)	baseline
Fever	28 (14)	20 (71)	0.15
Obstetric or gynaecological problem	14 (7)	2 (14)	<0.005
GI (vomiting, diarrhoea, jaundice, stomach)	10 (5)	5 (50)	0.74
Asthma or lung problem	8 (4)	4 (50)	0.77
Hypertension or diabetes	8 (4)	1 (13)	<0.05
Psychiatric (stress, nervous)	8 (4)	4 (50)	0.77
Accident or injury	7 (3.5)	5 (71)	0.42
Headache	6 (3)	2 (33)	0.10
Weakness	5 (2.5)	2 (40)	0.50
Kidney problem	5 (2.5)	3 (60)	0.85
Allergy	5 (2.5)	3 (60)	0.85
Cough, sore throat or runny nose	5 (2.5)	1 (20)	0.13
Dermatologic problem	5 (5)	1 (20)	0.13
Surgery related	4 (2)	2 (50)	0.83
Other	6 (3)	1 (17)	0.07

With the exception of hypertension and obstetric or gynaecological visits there was no significant difference in the rate of injection depending on the patient's chief complaint. Patients reported that for their last injection the syringe/needle set was taken from a closed packet 58% (n= 116) of the time; a pan of water 11% (n= 21), other 3% (n =5) and unknown 28% (n= 56). It is common practice in Pakistan to 'clean' needles by wiping or rinsing them immediately before injection. Needles were observed to be 'cleaned' in 49% (n= 98) of injections; the method used was placement in a pan of water (54% of those cleaned, n= 52), wiping the needle with an alcohol swab (44%, n= 43) or soaking in a disinfectant (2%, n= 2). Since commercial alcohol swabs are not commonly available, it is likely that the swabs used are either non-sterile cotton balls soaked in alcohol, or simply a dry cotton ball. Even when a syringe and needle were taken from closed packets, they were cleaned 59% (n =68) of the time. Only 5% of patients could name the medicine last injected into them. Seven patients (4%) reported that a used needle had at some time made them sick: four contracted a local skin infection or abscess, one jaundice and two an unspecified illness.

Patient attitudes regarding use of injections

Patients paid the same amount for their last visit whether or not they received an injection (median US\$ 0.96), though they thought a fair price for a visit including an injection should be more than for a non-injection visit (median price \$0.65 vs. \$0.48.) The vast majority (n= 181, 91%) of patients stated that the practitioner always recommends an injection. By contrast, only 19 patients (10%) reported they ever asked for injections and only two of these (10%) had ever been refused.

If not given an injection, only 20 patients (11 %) stated they would sometimes or always be disappointed and 163 (83%) stated they would always return to a practitioner who refused them an injection - an additional 17 (9%) would return sometimes. 181 patients (91%) stated they would not go to other practitioners seeking an injection. None of the seven patients who were ever refused an injection left and sought a different practitioner to obtain one.

Seven men (8%) and 25 women (23%) had refused an injection in the past (mean number of refusals =4.4). The most common reasons for refusal in both groups were fear or pain (n= 18, 56%). No patient answered that they refused because they did not trust the practitioner. Patients with a higher than the

mean income (OR 1.8, 95% CI 0.98-3.4) and education (RR 1.6, 95% CI 0.8-3.1) tended to be more likely to have refused injections but this was not statistically significant.

Most patients thought injections were more powerful (n= 126, 64%) and quicker acting (n= 109, 55%) than oral medication, but only 75 (38%) felt that injections last longer. Asked their preferences if therapy was equally effective, patients chose pills (n= 114, 58%) over advice (n= 49, 25%) or injections (n= 31, 16%). Most patients (171, 86%) stated they think it is usually possible to get better without an injection; 172 (87%) think tablets are available for many common illnesses, and 105 (53%) think most illnesses for which they visit a health practitioner will go away on their own with time.

Patient knowledge of risk of injections

Most patients (n= 164, 83%) thought a used needle could transmit a fatal disease; 177 (89%) thought it could make a person sick. When asked separately about each of the following diseases, about two-thirds of patients thought used needles could transmit AIDS (n =132, 67%), hepatitis (n = 136, 69%), liver failure (n= 127, 64%) and liver cancer (n= 124, 63%) while most of the remainder reported they did not know. Less than 2% thought that these diseases were not transmitted by used needles.

Persons with more than the median of 8 years of education who correctly identified three or more needletransmitted diseases were 0.14 times as likely to have received five or more injections per year in the preceding 5 years as persons with more than 8 years of education who identified fewer than three (RR 0.14; 95% CI 0.04-0.47). This was not true of the less educated (RR 1.36; 95% CI 0.85-2.15). The more diseases the educated could correctly identify as transmissible by reused needles, the less likely they were to have received more than five injections per year (Chi square = 5.6, P<0.02). Again, this trend was absent among those with less education (Chi square = 0.13, P= 0.7).

There was no significant relationship between knowledge of needle risks and history of ever having refused an injection. Significantly fewer patients who correctly identified three or more risks of injections (10.4%, n 14/135) preferred needles over pills or advice (RR 0.38, 95% CI 0.20-0.73, P<0.005) compared to patients with knowledge of less than three risks (27%, n = 17/63). Most patients (172, 87%) stated they would get fewer injections if they thought a used needle could make them sick.

Discussion

This study confirms that adults in Karachi were put at substantial risk for infection with blood-borne pathogens when they visited their general practitioner. Injections were vastly overused, 30% of patients having received 10 or more injections in the last year. Poorer and less educated patients tended to get more injections and to know less about the risks of injections with unclean needles. Injections were used indiscriminately - half of all visits included an injection regardless of the presenting complaint. This lack of discretion suggests that they were not dispensed on the basis of good medical practice. Injections in this study were often given without proper infection control practices. Although not directly proven by this study design, it is strongly suggested that the needles coming from bowls of water were re-used and/or contaminated and other studies in Pakistan bear this out (Gumodoka et al. 1996; Khan et al. 2000). The result is a situation where injections carry a real risk in the face of little or no benefit.

Two major public health consequences of this mode of transmission are crossover and amplification. Reuse of needles creates a situation where the health practitioner's clinic can become the point of crossover of disease transmission from groups at high risk of acquiring bloodborne viruses (e.g. people with multiple sexual partners, prostitutes, men who have sex with men, and intravenous drug users) to those who may otherwise be characterized as low risk groups in the general population. In this way, the general practitioner and community hospitals also easily become the means for the amplification (that is, the rapid exponential increase in the number of infected individuals) of bloodborne epidemics as occurred via the hospital with Ebola virus in Sudan (Baron et al. 1983). Although the numbers of

people in Pakistan infected with HIV in 1995 were low (HIV Seroprevalence Study Group of Pakistan 1996), the epidemic will likely rise rapidly in the general population once a critical number of infected patients visit their local doctor. HCV and HBV rates are already quite high (Mujeeb and Mehmood 1996; Luby et al. 1997). This puts an immense number of patients in Pakistan at risk for HCV, HBV and potentially HIV and other diseases.

Despite a mean education level of six years, patients had reasonable knowledge that re-used needles were risky. This knowledge declined but was not extinguished in those with less education. Knowledge of specific risks of injections, however, was not enough - it had to be coupled with general education, that is, schooling, in order to influence behaviour and reduce the number of risky injections. This has important public health implications for interventions designed to reduce these behaviours. Such programs should consider the educational level of the population they hope to impact, strive for providing at least a minimal general education whenever possible, and consider starting with a relatively educated cohort when introducing new strategies.

Despite knowledge of these risks, few patients (16%) ever refused injections. Unlike the situation described in Uganda (Birungi 1998) there have been no massive anti-AIDS education campaigns in Pakistan to warn people against the dangers of sharing needles. Methods designed to empower patients to take a more active role in the decisions regarding their health care might be tried to overcome patient reluctance to question the doctor's treatment plan.

The attitude of patients regarding injections was rather balanced and open. An injection was regarded neither as a panacea nor as the only viable treatment. Although they value injections more in terms of paying a higher price and thinking that injections are more powerful, patients do not think injections last as long as pills and they prefer pills and advice five to one over injections if told they are equally effective. This view may prove an ally to future public health messages. Patients stated that they would rarely avoid the practitioner who refuses them an injection, nor shop for another doctor who would provide one. Although their behaviour may differ significantly when actually confronted with a refusal of an injection, it seems to reflect a trust of the doctor's recommendation over the perceived value of the injection itself. This information may be useful in educating health practitioners and mitigating their concerns about the economic consequences of decreasing injection use in their clinics.

Information similar to this was used successfully in an intervention to reduce use of injections at public health facilities in Indonesia (Prawitasari et al. 1996).

The effect of the health practitioner has been to promote the use of injections in the climate of a moderate patient inclination toward their use. Practitioners recommend most injections and give them in 50% of visits. The reason for this may, in part, be economic. There is a substantial body of evidence that practitioners decide therapies based upon their own financial interest (Volinn et al. 1992).

Practitioners typically keep a number of multi-use vials of injectable medications in their office. An injection can be included in the cost of the visit, whereas prescription of oral medication involves additional cost to the patient. Prescribing medications that can be obtained outside the doctor's office and usually without a prescription may be financially risky to the doctor in that the patient may bypass them with the next illness and go straight to the chemist. Another reason why injections may be overused by doctors is the inability to definitively diagnose an illness due to multiple factors including financial restraints against diagnostic services, poor training of doctors, a population burdened with a host of complicated acute and chronic illnesses, and too little time spent with patients. An injection, beyond its power as a placebo, can serve as a definitive procedure, cover up a lack of knowledge, be provided quickly from materials readily at hand, and conform to what doctors perceive as the patient's expectations.

Patients in many cases observed practitioners using improper infection control practices when administering injections - most importantly by re-use of plastic, disposable equipment. This is similar to findings of a study conducted outside Karachi by medical students doing observations during unannounced visits to general practitioners' offices (Khan et al. 2000). This again may have economic

causes: a disposable needle and syringe set cost US\$ 0.06 at the time of the study. This vanishingly small amount, when multiplied by re-using the set approximately 10-30 times, still seems small, but considering the US\$ 0.96 per visit and incomes for doctors often less than US\$ 200 per month, reuse could amount to appreciable financial benefit over time. It is not uncommon to find that the doctor has a dispenser actually giving the injection - sometimes a young boy with on-the-job training. Thus economic reasons and poor training may play a significant role in both the overuse as well as the improper handling of injections.

A potential limitation of this study is that the study population was university facility-based and does not necessarily represent the typical experience of Karachi residents. Aga Khan University Community Health Center clinic users are somewhat better educated and had higher household incomes than the general population which might affect the exact percentages of various practices and attitudes.

However, our study did include a substantial number of poor, uneducated patients and our results correlate roughly with a study in a pen-urban area outside Karachi. 81% of patients exiting from general practitioners' offices there had received an injection, and almost none of these injections were judged by reviewers to be medically necessary (Khan et al., 2000). This suggests that the frequent and indiscriminate use of needles seen in our study also occurs in other settings in Pakistan.

Recall bias may have played a role in the results of this study. Extending the time of recollection from 1 to 5 years resulted in the disappearance, for example, of male/female differences in annual injection rates. It may be that injections over the 5 years were even more frequent than stated. On the other hand, since people were sick enough to come to the university clinic, their recent injection history may overestimate their total number of injections.

Another limitation is that the questionnaire assessing patient knowledge of needle risks used leading questions without distracters (intentionally incorrect answers presented as a choice in a multiple-choice question). Nonetheless, a large number of patients - both those with and without much education - admitted that they did not know and we consider it unlikely that the lack of distracters affected the trend in the results. The study relied on patient observation to get some evaluation of the safety of the injections they had received. This may actually underestimate the danger because needles observed to be taken from packages (and presumably sterile) may not have been - they may have come from the reused and repackaged needle black market or they could have been replaced in the packets by the practitioner. Direct observation by medical students in the study by Khan revealed an extremely high re-use rate (Khan et al. 2000).

Efforts to reduce the high-risk behaviours surrounding needle use could target general practitioners, medical equipment, or patients. Regulation of general practitioners by government or medical societies is not very likely to be effective, given the current state of these bureaucracies in Pakistan. Vos et al. (1998) successfully decreased the use of injections and improved the knowledge regarding sterilization through the development of guidelines and the education of healthcare personnel. Educational interventions exclusively in healthcare personnel, however, are not likely to completely overcome the economic incentives contributing to the problem.

Studies of needle/syringe sets which are specifically designed to prevent re-use by locking have shown them to be feasible to use for certain types of immunization injections, difficult but not impossible to re-use, and more expensive than conventional disposable syringes (Steinglass et al. 1995). Even if instituted widely in Expanded Program of Immunization (EPI) programs, they are unlikely to completely replace the billions of conventional disposable syringes being misused in other settings today.

Safe injections require healthcare workers to have a knowledge of sterilization, injection and disposal procedures, the motivation and supervision to properly perform these procedures, and an adequate supply of appropriate injection equipment (Aylward et al. 1995). Given Pakistan's current healthcare system, accomplishing improvements among healthcare workers in all of these prerequisites would be exceedingly difficult. It is therefore important to develop effective strategies to work on the knowledge

and expectations of the general public as well.

The patients' balanced view of injections should be used to educate and empower them to be more informed and assertive consumers. Pilot studies examining the effect of educational interventions among patients are needed. Relatively educated people are more likely to respond to such messages, thus this calls for improvements in the general education of the population as a whole, and consideration of the education level in designing such pilot studies. Public health messages must be carefully constructed to avoid unforeseen side-effects such as in Uganda, where people distrusted needles from governmental hospitals and clinics but not from family members and neighbours (Birungi 1998). More work is needed focusing on understanding the specifics of where and why people seek injections. Further investigation of medical waste management is needed to ascertain the scope of the repackaging problem, and to insure sterility of packaged injection equipment.

Needles must be used less frequently and only with proper sterilization and hygiene. The lives of literally millions are at risk. Although improving literacy and access to general education and reducing poverty will likely be helpful, intense interventions which increase specific knowledge of the risks of needle use are also needed. National and worldwide effort should be aimed at decreasing this iatrogenic cause of widespread morbidity and mortality.

References

1. Aylward B, Lloyd J, Zaffran M et al. (1995) Reducing the risk of unsafe injections in immunization programmes: financial and operational implications of various injection technologies. *Bulletin of the WHO* 73, 531-540.
2. Baron R, McCormick JB & Zubeir O (1983) Ebola virus disease in southern Sudan. Hospital dissemination and intrafamilial spread. *Bulletin of the WHO* 61, 997-1003.
3. Birungi H (1998) Injections and self-help: Risk and trust in Ugandan health care. *Social Science and Medicine* 47, 1455-1462.
4. Centers for Disease Control (1993) Improper infection-control practices during employee vaccination programs - 1993. *Morbidity and Mortality Weekly Report* 42, 969-971.
5. Clayton S, Yang H, Guan J et al. (1993) Hepatitis B control in China: knowledge and practices among village doctors. *American Journal of Public Health* 83, 1685-1688.
6. Cunningham CE (1970) Thai 'injection doctors' antibiotic mediators. *Social Science and Medicine* 4, 1-24.
7. Dean AD, Dean JA, Burton il-I et al. (1990) Epi Info Icomputer programi, Version 5.01. Centers for Disease Control, Atlanta (GA).
8. Fisher-Hoch SP, Tomori O, Nasidi A et al. (1995) Nosocomial Lassa fever: the high price of poor medical practice. *British Medical Journal* 311, 857-859.
9. Gumodoka B, Vos J, Berege ZA et al. (1996) Injection practices in Mwanza Region, Tanzania: prescriptions, patient demand, and sterility. *Tropical Medicine and International Health* 1, 874-880.
10. HIV Seroprevalence Study Group of Pakistan (1996) HIV seroprevalence surveys in Pakistan. *AIDS* 10, 926-927.
11. Hersh BS, Popovici F, Jezek Z et al. (1993) Risk factors for HIV infection among abandoned Romanian children. *AIDS* 7, 1617-1624.
12. Hayashi J, Kishihara Y, Yamaji K et al. (1995) Transmission of Hepatitis C virus by health care workers in a rural area of Japan. *American Journal of Gastroenterology* 90, 794-799.
13. Khan AJ, Luby SP, Fikree FF et al. (2000) Unsafe injections and the transmission of hepatitis B and C in a periurban community in Pakistan. *Bulletin of the World Health Organization*. 78(8), 956-963.
14. Ko Y, Li S, Yen Yet al. (1991) Horizontal transmission of hepatitis B virus from siblings and intramuscular injection among pre-school children in a familial cohort. *American Journal of*

Epidemiology 133, 1015-1023.

15. Luby S, Qamruddin C, Shah A et al. (1997) The relationship between therapeutic injections and high prevalence of hepatitis C infection in Ha?zabad, Pakistan. *Epidemiology and Infection* 119, 349-356.
16. McVea K (1997) Lay injection practices among migrant farmworkers in the age of AIDS: evolution of a medical folk practice. *Social Science and Medicine* 45, 91-98.
17. Michel J-M (1985) Why do people like medicines? A perspective from Africa. *Lancet* 1.210-211.
18. Mortimer P (1995) Arsphenamine jaundice and the recognition of instrument- borne virus infection. *Genitourinary Medicine* 71, 109-119.
19. Mujeeb S & Mehmood K (1996) Prevalence of HBV, 1-ICV. and HIV infections among family blood donors. *Annals of Saudi Medicine* 16, 702-703.
20. Narendranathan M & Philip M (1993) Reusable needles - a major risk factor for acute virus B hepatitis. *Tropical Doctor* 23, 64-66.
21. Plot P & Carael M (1988) Epidemiological and sociological aspects of HIVinfection in developing countries. *British Medical Bulletin* 44, 68-88.
22. Prawitasari I-Iodiyono i, Suryatwati S. Danu S et at. (1996) Interactional group discussion: results of a controlled trial using a behavioural intervention to reduce the use of injections in public health facilities. *Social Science and Medicine* 42, 1177-1183.
23. Reeler A (1990) Injections. A fatal attraction? *Social Science and Medicine* 31, 1119—1125.
24. Steinglass R, Boyd D, Grabowski M et al. (1995) Safety. effectiveness and ease of use of a non-reusable syringe in a developing country immunization program. *Bulletin of WHO* 73, 57-63.
25. Schlesselman J (1982) *Case-Control Studies*. Oxford University Press, New York, pp. 203-206.
26. Volinn E, Mayer I, Diehi P et al. (1992) Small area analysis of surgery for low back pain. *Spine* 17, 5.
27. Vos J, Gumodoka B, van Asten HA et at. (1998) Improved injection practice after the introduction of treatment and sterility guidelines in Tanzania. *Tropical Medicine and International Health* 3, 29 1-296.
28. Wyatt H (1984) The popularity of injections in the Third World: origins and consequences for poliomyelitis. *Social Science and Medicine* 19, 911-915.