Safe injection practices in a primary health care setting in Oman

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ممارسات الحقن المأمون في مرافق الرعاية الصحية الأولية في سلطنة عُمَان

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الخلاصة: قام الباحثون بإجراء مسح وطني لممارسات الحقن في 78 من المرافق الصحية الحكومية في سلطنة عُمَان في عام 2001. وقد حصلوا على المعطيات من خلال إجراء اللقاءات ومن الملاحظة الشخصية. وأظهر المسح جودة المعايير المتَّبعة بوجه عام، وكفاية المخزون من المعدَّات الوحيدة الاستعمال. ولم يلاحظ إعادة تغطية الإبر إلا في مرفق واحد فقط، ولو أنه لوحظ احتواء صناديق النفايات على إبر معاد تغطيتها، وذلك في 28٪ من المرافق. وسجل في 17.9٪ من المرافق، وقوع إصابات ناجمة عن وخز الإبر في العام السابق. وفي 9٪ من هذه المرافق، لوحظ وجود أدوات حادة حول المرفق، كما وجدت حاويات للتخلص من الفضلات غير خاضعة للإشراف في 12.8٪ من المرافق. ولوحظ أن تخزين الصناديق الملأى بالبضائع كان يتم بشكل غير مأمون في 11.5٪ من هذه المرافق. ومع أن التخلُّص من النفايات كان يتم بعيداً عن المرافق الصحية، إلا أن 33.3٪ منها فقط كان يتخلص من هذه النفايات بالترميد الصحيح.

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ABSTRACT We conducted a national survey of injection practices in 78 government health facilities in Oman in 2001. Data were obtained by interview and observation. The overall standards were good and the stock of disposable equipment was adequate. Recapping of needles was only observed in 1 facility but in 28%, waste disposal boxes contained recapped needles and 17.9% reported needle-stick injuries in the past year. In 9% of the institutions, sharps were observed around the facility, in 12.8% unsupervised disposal containers were seen and in 11.5% unsafe storage of full boxes was observed. While disposal of the used waste was done away from the health facility, only 33.3% disposed of it by correct incineration.

Pratiques d'injection sûres dans le cadre des soins de santé primaires à Oman
RÉSUMÉ Nous avons réalisé une enquête nationale sur les pratiques d'injection dans 78 établissements de santé gouvernementaux à Oman en 2001. Le niveau général était bon et le stock de matériel à usage unique était suffisant. Le recapuchonnage des aiguilles n'a été observé que dans un établissement mais dans 28 % des établissements, les boîtes prévues pour l'élimination des déchets contenaient des aiguilles recapuchonnées et 17,9 % des établissements avaient signalé des blessures par piqûre d'aiguille dans l'année écoulée. Concernant 9 % des établissements, on a observé des objets tranchants aux alentours, dans 12,8 % on a constaté la présence de conteneurs d'élimination non surveillés et dans 11,5 % le stockage non sécuritaire des boîtes pleines. Si l'élimination des déchets utilisés s'effectuait à distance de l'établissement de santé, seuls 33,3 % des établissements les éliminaient en les incinérant correctement.

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Introduction

Mathematical modelling of available epidemiological data suggests that each year unsafe injection practices are responsible for 8 to 16 million people contracting hepatitis B virus (HBV), 2.3 to 4.7 million people contracting hepatitis C virus (HCV), and 80 000 to 160 000 people contracting human immunodeficiency virus (HIV) worldwide. In most cases, the transmission of these agents goes unrecognized because the infection is initially subclinical [1]. Globally, it has been estimated that unsafe injections cause about 1.3 million deaths annually [2]. In most developing countries, unsafe injections occur routinely, posing a significant potential threat for the transmission of bloodborne pathogens such us Hepatitis B, C and HIV [2,3].

In 2000, the Word Health Organization (WHO) estimated that contaminated injections might have caused 250 000 HIV infections among injection recipients and 1000 among injection providers [4]. In developing countries it is estimated that 20%–50% of all injections administered are unsafe or done with re-used syringes [2]. In addition, in some countries of the WHO Eastern Mediterranean Region like Egypt and Pakistan, unsafe injections have been a significant mode of transmission responsible for the introduction of HCV [5–7].

In Oman, safe injection practices have been followed since the early 1970s. Due to concern over transmissible infections such as hepatitis B, C and HIV, disposable syringes have been used for vaccines as well as for other injections in all the health institutions. There have been no documented shortages of the supply of syringes and needles at any level of health care delivery which might lead to reuse of injection equipment.

Health care delivery in Oman is almost entirely through the Ministry of Health (MOH) and the private sector contributes to some specialized tertiary health care components. Vaccines under the Expanded Programme on Immunization (EPI) are provided free to all MOH institutions and there are some nominal charges for private health care services.

Vaccine-associated unsafe injection practices are also monitored by analysing data on acute events following immunizations (AEFI). The AEFI surveillance was launched in Oman in 1993 as a complementary programme to EPI. Ever since, the data are routinely compiled and analysed at the national level. The events are broadly classified into the following categories: BCG adenitis, local reactions, injection abscess and systemic reactions. However, AEFI surveillance is not sufficient to entirely reveal all aspects of injection practices being followed in a country.

In order to validate the assumption that in Oman all components of safe injection practices are being followed, a national survey was undertaken in the primary health care setting with technical assistance from WHO. The study was conducted to determine whether the health facilities surveyed met the necessary requirements in terms of injection equipment, supplies and waste disposal and to determine whether all the critical steps of injection administration were being executed in accordance with the recommended standards. The main objective was to identify unsafe injection practices and make the necessary modifications to the existing policies through recommendations to decision-makers.

Methods

Our study was a cross-sectional observation survey covering the entire country, which is administratively divided into 8 provinces (6 regions and 2 governorates) and further divided into 59 districts (*wilayat*). The population size was derived from the projections based on the 1993 census provided by the Ministry of National Economy.

The provinces were listed along with their respective populations. Eight clusters were then randomly selected from the provinces (1 from each province) using probability proportional to size sampling technique. Only government health facilities providing primary health care (preventive and curative), i.e. health centres, extended health centres and *wilayat* hospitals, were included. Private clinics as well as hospitals, providing secondary and/or tertiary care were excluded from the survey.

The estimated total sample size required 80 health care facilities. Thus for each cluster within the region 10 primary health care facilities were then randomly selected. In Muscat governorate for the 2 selected clusters only 18 primary health care facilities were available. Hence, finally it was decided to include a total of 78 primary health care facilities in the survey. All the selected facilities were surveyed except 1 in the southern Dhofar region. This health centre was not operational at the time of the survey and hence was substituted by another nearby health centre.

Four teams of field workers of the cadre of national EPI supervisors working in the MOH were recruited for data collection. Each team comprised of 2 experienced staff members familiar with EPI and the injection equipment. Each team was responsible for collecting data in 2 clusters (10 health facilities per cluster).

This injection safety assessment was conducted using the new WHO/BASICS standardized assessment tools that were developed in the framework of the Safe Injection Global Network (SIGN) coalition [8]. Survey data collection was conducted using 2 different but complementary methods. The first was to carry out a systematic observation of the health facility focusing on supplies of injection equipment, handling and delivery of injection services, safety precautions and waste disposal procedures. The second was to interview injection providers and supervisors as a primary source of data using a standard structured questionnaire. In a health centre, at least 2 staff nurses were interviewed while in a small hospital we interviewed 8–10 staff members. The knowledge, attitude and practices of the staff that may favour needle-stick injuries were assessed by interviewing the staff concerned. A facility was judged on the basis of the general consensus as well as on the beliefs of the key senior supervisory staff. It is worth noting that usually the opinions and beliefs of the senior staff concerning a procedure is taught and followed by the other staff. The interviewers were trained to assess all available evidence and only then to classify a facility.

A WHO consultant visited Oman from 4 to 6 June 2001 prior to launching the survey, at which time all the field workers were trained in the data collection tools and procedures. Special emphasis was placed on tactfulness of observation and conduct of the interviews. Practical demonstration in carrying out the structured interviews and observations was also given. During the WHO consultant's visit, the questionnaire was revised and refined to fit the local circumstances after carefully studying the prevailing injection practices in Oman through detailed discussion with the central supervisory staff and a field visit to a primary health care facility. Questions related to auto-disable syringes and sterilizable

injection equipment or needle-removers or needle-cutters were omitted as they were not relevant to Oman. The questionnaire was reviewed to ensure that it covered the major areas and issues related to injection equipment, procedures and waste management. Data collection started on June 10, 2001 and was completed by July 7, 2001.

The logistics for the field visits was provided by the MOH. Each team was instructed to contact the regional directorate upon arrival and to request for administrative assistance. The selection of the region, the names of the health institutions as well as the day of visit were not disclosed in order to preserve the element of surprise and to ensure that the prevailing practices were observed. The field team visited the institution and briefed the medical officer in charge about the purpose of the survey before conducting the interviews.

The survey did not involve any experiment on human subjects and hence the question of ethical issues did not arise. Field workers were informed that they should tactfully interrupt an injection that would be obviously harmful to the recipient if it was about to occur.

The field teams did not face any major constraints during the survey. Occasionally the administrative head of the health institution questioned why they had not been informed in advance. However, after explanation by the field staff of the reasons for not doing so, their concerns were allayed and they agreed to cooperate.

Data were entered and analysed using *Epi-Info*, version 6.04 software.

Results

All 78 selected health facilities were visited during the survey. One facility in Dhofar Governorate was closed and hence substituted by a nearby health centre. Most of the facilities were from the rural areas providing primary health care services (60 health centres and 4 extended health centres). The 14 small hospitals included in the survey were either *wilayat* (district) level or local hospitals providing primary heath care services.

As Oman had long abandoned the use of sterilizable syringes and needles and single-use disposable injection equipment was routinely in use in all the health facilities, all data collected were on disposable syringes and needles.

On the day of the visit, 27 (34.6%) health facilities were providing immunization services. An average of 12.9 injections for immunization were administered per day per institution (range 1 to 150). Similarly, during the visit 12 (15.4%) of the health facilities were also engaged in other curative activities involving injections. On average, 22.2 injections were offered for therapeutic purposes per day per institution (range 1 to 190). Overall, 63.2% of the injections administered were for therapeutic purposes, while 36.8% were administered for vaccination.

Supply of disposable syringes in almost all facilities was found to be abundant in relation to the reported workload of weekly injections. The syringes of 1 mL, 2 mL, 3 mL and 5 mL were supplied attached with needles. Of these, 1 mL, 2 mL and 3 mL syringes were used for immunizations while the 5 mL syringes were used only for transferring diluent.

On average 4096 syringes were in stock per health facility while the weekly average injection load for each was 245. In other words, the supply would allow each facility to continue providing injection services for a minimum period of about 16 weeks.

Table 1 shows the distribution of health facilities by the sufficiency of syringes and needles. Most of the health facilities were

Table 1 **Sufficiency of the supply of injection syringes observed in the health facilities**

Supply sufficient for:	Health facilities (n = 78)	
	No.	%
< 2 weeks	1	1.3
2–4 weeks	9	11.5
5–8 weeks	6	7.7
> 8 weeks	62	79.5

comfortably supplied with assorted syringes sufficient for over 2 weeks, of which 62 (79.5%) had enough supplies for over 8 weeks. Only 1 of the facilities, had supplies sufficient for less than 2 weeks.

The stock of disposable syringes was found to be adequate in all the health facilities. However, 3 (3.8%) institutions had experienced shortages of certain equipment at some point. This shortage was due to the faulty inventory and indenting procedures followed in those health facilities and not due to actual short supply. All the respondents were unanimous in confirming that sufficient quantities of injection equipment were generally available at the health facilities and that there had never been any occasion when vaccinations or therapeutic injections were abandoned because of the non-availability of injection equipment.

Since not all the health facilities were carrying out injections on the day of the visit, the data presented on the "observed" injection practices apply only to the 39

Table 2 **Selected indicators of injection practice observed in the health facilities**

Injection practice indicator	Immunization (n = 27)		Other injections (n = 12)	
	No.	%	No.	%
Clean designated table or tray	27	100.0	12	100.0
Use of syringe from sterile packet or fitted with 2 caps	27	100.0	12	100.0
Use of needles from sterile packet	27	100.0	12	100.0
Removal of needles from multi-dose vial between injections	26[a]	96.3	12	100.0
Use of clean barrier to break ampoule	7	25.9	5	41.7
For each reconstitution, use of sterile syringe and needle	24[a]	88.9	12	100.0
Reconstitution of vaccine/drug with correct volume of diluents	23[a]	85.2	9	75.0
Vials kept at 2–8 °C during period of use	27	100.0	NA	NA
Vaccine vial shaken prior to withdrawing content	23[a]	85.2	NA	NA
Needles recapped after injection	0	0	1	8.3

[a]In the remaining health care facilities the specified indicator was not applicable.
n = number of health facilities.
NA = not applicable.

health institutions that were carrying out injections. Table 2 highlights some of the selected indicators applicable to injection safety based solely on observations by the interviewer at the time of visit to the health facility. This shows that safe practices were generally followed. However, the use of a clean barrier while breaking the ampoule was followed in only 7 out of 27 (25.9%) facilities carrying out the procedure. In addition, while recapping of needles after injection was only observed in 1 health facility, in 22 of the 78 (28.2%) surveyed institutions, the waste disposal boxes contained recapped needles, suggesting that recapping was a fairly common practice despite clear instructions to the contrary. In fact, 1 EPI staff nurse even argued with the interviewer that recapping should be done prior to disposal.

Waste disposal safety boxes were universally available. In all of the health facilities surveyed the safety containers were available in stock. In the majority (78.0%), 5 or more safety containers were being used or were available at the time of the survey (Table 3).

Fourteen (17.9%) institutions reported needle-stick injuries in the past year. In 1 institution, 4 such incidents were reported (Table 4).

Needle removal by hand was considered an appropriate practice by the members of

Table 4 Frequency of needle-stick injury reported in the health facilities

Number of incidents of reported needle-stick injury	Health facilities (n = 78)	
	No.	%
None	64	82.1
1	8	10.3
2–3	5	6.4
4	1	1.3
Total	14	17.9

There were a total of 22 needle-stick injuries reported.

staff in 11 (14.1%) of the facilities, while in the majority of centres (79.5%), the staff was aware of the MOH policy of the disposal of syringe and the needle together (Table 5). The health staff of 18 (23.1%) health institutions was not aware of where to report after a needle-stick injury. While all the health facilities had MOH EPI manual, few (28.2%) were in possession of specific protocols for injection safety other than the EPI manual. Shortage of syringes and needles was reported by 3 facilities in the last 12 months and that of safety containers by 5 facilities (Table 5).

Table 6 summarizes the important observations regarding injection waste-disposal practices. In all the surveyed sites, disposal was carried out at a remote place, i.e. away from the injection room. However, in 7 (9.0%) of the facilities, used sharps were observed around the heath facility while sharps in open containers were observed in 3 (3.8%) facilities, both of which are a risk for needle-stick injury. Unsupervised sharps boxes (casual placement away from observation by staff) were seen in 10 (12.8%) centres, while unsafe storage of full boxes (full, open boxes accessible to staff, patients cleaners, etc.) was observed in 9 (11.5%) health facilities.

Table 3 Safety boxes available in stock observed in the health facilities

Number of safety containers	Health facilities (n = 78)	
	No.	%
1 to 4	25	32.1
5 to 9	25	32.1
10 to 20	19	24.4
> 20	9	11.5

Table 5 **Knowledge and practices of injection providers and supervisors (interviews and observation)**

Activity	Health facilities ($n = 78$)	
	No.	%
Removal of needle by hand before disposal	11	14.1
Practice of throwing needle with syringe	62	79.5
Institutions reporting needle-stick injuries	14	17.9
Knowledge of where to report after needle-stick injury	60	76.9
Specific person assigned for sharps disposal	62	79.5
In possession of standard operating procedures: *National EPI manual* [9][a]	78	100.0
In possession of any other injection safety policy/protocol[b]	22	28.2
No shortage of syringes & needles in the last year	75	96.2
No shortage of safety containers for waste disposal in last year	73	93.6

[a]*The facilities were classified into categories based on the response of the key senior supervisory staff since generally the others followed their instructions.*
[b]*Verbal responses were verified by observation wherever feasible.*

Final disposal of injection waste by incineration is the recommended method, but such facilities are not available universally in Oman. Only the new regional referral hospital at the regional headquarter *wilayat* had the proper equipment and facilities for incineration of injection and other types of hazardous medical waste. In some regions

Table 6 **Indicators of injection waste disposal observed in the health facilities**

Injection waste disposal indicator	Health facilities ($n = 78$)	
	No.	%
Presence of sharps boxes in injection room/area	75	96.2
Presence of overflowing, pierced or open container	5	6.4
Full sharps boxes stored safely waiting for disposal	66	84.6
Full sharps boxes stored unsafely waiting for disposal	10	12.8
Sharps in open container posing risk of needle-stick injury	3	3.8
Evidence of used sharps around the health facility	7	9.0
Transport of waste off site	78	100.0

the peripheral health centres and hospitals (33.3%) had established a procedure to transfer the hazardous waste to the regional hospital for incineration. However, this practice was not universally followed (Table 7). In the majority (66.6%) of the health facilities, final disposal was either done by burning (37.2%), burial (1.3%) or dumping (28.2%) on municipal land.

Discussion

Several countries have used the WHO assessment tool to validate the injection safety practices (A. Zenaw, Assessment of injection practices in Egypt, 2000; Y. Berhane, Report of injection safety survey in Ethiopia, 2000. Unpublished reports).

Although Oman has overall good standards of injection safety, an assessment can certainly provide information to identify weak areas in order to improve further the standards. The MOH has issued clear guidelines (standard operating procedures) in the *EPI manual* [*9*] to all health institutions and the private sector. Furthermore, the system of regional and national supervision of the EPI programme is well established and functions effectively. The national supervisors periodically visit the regions as well as the private clinics certified to administer vaccination.

The supply of injection equipment, including safety disposal boxes, in all the health institutions was ample. It is worth noting that indenting for and supply of injection equipment/drugs and vaccines is from 2 different government departments; Medical Stores and Central Vaccine Stores respectively.

Although relatively few instances were on record, needle-stick injuries do continue to occur in some facilities, thus exposing the health care workers to the risk of infection of bloodborne pathogens [*10*]. Recapping needles is recognized as the practice most likely to lead to needle-stick injuries [*11–13*] and it is against MOH policy. The survey revealed that, although recapping was not a common practice, it was still being done in some institutions. Indeed, some staff still manually remove needles, another practice that can lead to needle-stick injury. Therefore, there is a need to reaffirm MOH policies and for strong and sustained supervisory action to prevent injection-associated infection [*3*]. Similarly, clear policy and guidelines should be made available for the reporting and management of needle-stick injuries.

A shortage of syringes and needles was reported by some of the health facilities in the last 12 months. This information, however, was contrary to the observation of an ample supply of all the required equipment at the time of our interviews. After further inquiry, it became apparent that this shortage was due rather to lack of an inventory and timely indent than an actual shortage. Similarly the indenting procedures for safety containers should be streamlined so that shortages of this essential piece of equipment do not lead to a compromise on safety.

All the health staff interviewed were generally aware of the safety concerns of the MOH regarding injection practices.

Table 7 **Type of waste disposal facility used by the health facilities**

Type of disposal	Health facilities (*n* = 78)	
	No.	%
Incineration in the hospital	26	33.3
Open burning on municipality land	29	37.2
Burial in municipality land	1	1.3
Dumping on municipality land	22	28.2

However, the policies and guidelines encompassing all the issues of injection safety were not clearly defined.

Final disposal of injection waste by incineration is the recommended method [14]. Unsafe waste management of sharps may expose the community to needle-stick injuries [15]. The survey revealed that the practices and procedures of safe disposal of sharps and other injection waste were far from ideal and require further strengthening. There was no uniform practice of the final disposal of the waste. In some health facilities the used injection equipment was either not stored properly prior to disposal or discarded indiscriminately. Such unsafe practices may result in the exposure of the general community to bloodborne pathogens. Thus injection waste disposal practices and facilities in Oman need to be improved.

Conclusions

The survey revealed that the overall standards of injection safety in Oman were good. However, there are some areas of concern where safe practice needs to be strengthened. The following recommendations were made based on the observations and results of the survey.

- The policies and guidelines as well as the protocols on injection safety practices should be unambiguous with reference to equipment supply and handling, sharps collection and final disposal. Injection equipment indent and supply procedures should be streamlined particularly for the safety containers.
- The essential elements of safety procedures should be displayed in the form of a poster in all health facilities at the loca-

tion where injections are offered. Such posters would prove to be a constant reminder to the staff.

- The final disposal of sharps should be considered a top priority in Oman. Incineration is the best method of safe disposal. An acceptable and practical system should be established to transport the waste on a regular basis to the incineration facilities available in the regional referral hospitals.
- A mutually agreeable arrangement should be made in collaboration with the local municipal authorities for safe disposal of injection waste in remote health facilities with no access to regional hospitals.
- Needle-stick injury should be made notifiable and a national protocol should be developed for its effective management.
- The next (3rd) edition of the EPI manual should include a specific chapter on injection safety and also should incorporate all the other recommendations from the present study.

Acknowledgements

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