

A Prospective Observational Study on Pattern of Poisoning Cases Reported to Emergency Department of a Teaching Hospital in South India

Mohammed Naseeruddin Nadeem^{1*}, Maliha Maqdoom²
and Mohammed Ezzuddin Akif³

¹Department of Pharmacology, Deccan College of Medical Sciences,
Hyderabad-500058, Telangana, India.

²Department of Physiology, Ayaan Institute of Medical Sciences,
Hyderabad, Telangana - 501504, India.

³Department of Anesthesia, Prince Mohammed bin Abdul Aziz Hospital, Madina, Saudi Arabia

*Corresponding Author E-mail: nad040@gmail.com

<https://dx.doi.org/10.13005/bpj/2061>

(Received: 13 April 2020; accepted: 03 December 2020)

A prospective observational study of 12 months duration was conducted in a teaching hospital on 278 cases of acute poisoning reported to emergency department from October 2018 to October 2019. Data regarding patient demographics, type of poisoning agent, duration of hospital stay and outcome were collected and analyzed. The common poisoning agents ingested were organophosphate compounds (41%), drug overdose (36%), Rodenticide (9%), House cleaning agents (6%), Mosquito repellents (4%), Corrosives (1%) and Kerosene (1%). Common drug overdose leading to poisonings were sedatives (9%), followed by nonsteroidal anti-inflammatory agents (4%). Of the 278 patients, 87 (31%) were males below 30 years of age. A major number of the patients worked as labourers (27%) and farmers (17%) and most were illiterate (36%). Suicide (79%) was found to be the major reason for poisoning. Acute poisoning is a major public health issue, especially among younger population and less educated. Analyzing the trends in poisoning in south India periodically will assist the healthcare workers and policy makers to devise suitable management and effective prevention strategies like educational interventions about insecticide handling and establishing poison information centres.

Keywords: Drug overdose, Organophosphorous, Poisoning, South India, Suicide.

Morbidity and mortality due to poisoning have been a major concern since time immemorial. The aetiology of poisoning may be either intentional (suicidal) or unintentional (accidental). Consciously ingesting poisonous substances and overdosing of medications are included under intentional poisonings whereas accidental over-intake of medications or chemicals and accidental snake bites are included under unintentional poisonings.

According to World Health Organization data, 370,000 and 193,469 deaths took place globally because of intentional and unintentional poisonings respectively in one year. The low to middle economy nations carry disproportionately greater share (84%) of poisoning cases reported worldwide. This is due to a variety of factors, most important being their considerably higher rate of exposure to hazardous materials.^{1,2}

The percentage of mortality due to acute poisonings in the developed nations is 2%, while in a developing nation like India, it is as high as 30% with approximately fifty thousand Indians dying annually.³⁻⁵

The pattern of poisoning in India showed variations depending on socio-economic status, with regions coming under low socio-economic status having increased rates of poisoning. In India, the easy availability of pesticides coupled with lack of knowledge regarding their poisonous properties contributes to an increased rate of poisoning. Availability of multiple medications at home and the ever-increasing sale of over the counter medicines have led to an increase in the rates of their over-dosing.⁶⁻⁸

In economically developed nations, toxicity is seen to be more associated with common household chemical agents like detergents, cleaning and cosmetic products and also with over the counter drugs like paracetamol. However, in a developing nation like India, the commonest poisoning agents were found to be insecticides and pesticides due to the country's dependency of its economy on agriculture and farming.^{9, 10} Agriculture, being the primary source of livelihood in India, organophosphates which are used in the agricultural farms as insecticides remain the commonest poisoning agents.^{11, 12} Aluminium phosphide is another chemical agent used as pesticide, which is more extensively utilized in north India when compared to the south. The

unregulated availability and easier access of the aforementioned chemical substances in India has led to a rise in deaths by poisoning.

An understanding of acute poisoning patterns of a particular region will assist in arriving towards a preliminary diagnosis of poisoning cases and also in devising their effective treatment plans. Along with identifying the population at risk for suicidal poisoning, such information will also provide guidance in designing interventions like psychological counselling and educating those at risk. Restricting the packaging and unchecked sale of insecticides by regulatory authorities is required.¹³ All these preventive strategies will aid in the reducing the number of poisoning attempts and their resulting deaths. The data pertinent to poisoning cases in south India is deficient. So, the present study was executed to perceive pattern of poisoning cases by collecting relevant data regarding parameters like socio-demographics, manner of poison intake, type of poisonings and their outcomes from a southern Indian teaching hospital.

MATERIALS AND METHODS

A single centre prospective observational study for a period of 12 months duration was conducted from October 2018 to October 2019 at Owaisi hospital and research centre (OHRC), after obtaining the Institutional Ethical committee approval. Suspected cases of poisoning due to

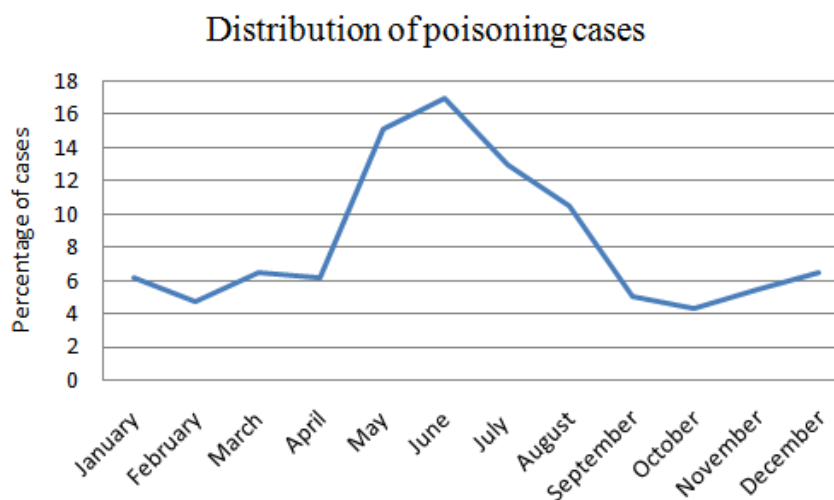


Fig. 1. Monthly distribution of poisoning cases

drugs, pesticides, insecticides, chemical substances and snake bites, who were aged between 18 to 60 years and belonging to either sex were included in the study. Excluded from the study were cases of allergic reaction to drugs, food poisonings and patients below 18 years and above 60 years of age. A total of 278 adult cases of acute poisoning reported to OHRC were considered eligible for the study. The data was acquired in a pre-structured proforma pertaining to age, sex, marital status, time of poisoning occurrence, category of poison ingested, exposure route, whether self-poisoned or accidental, time interval between the consumption and hospitalization, duration of hospital stay, end result of the poisoning and any sequelae in poisoning survivors. Descriptive analysis of the data was done by Microsoft Excel 2016 version.

RESULTS

More than half of the patients (52%) who presented to the emergency department were in the range of ages from 18 to 30, followed by 24% patients who were in the age range of 31 to

40 (Table 1). A higher incidence of poisoning was seen in males (58%) when compared to females (42%) (Table 1). Another finding was that married cases outnumbered the unmarried ones. Of the 278 cases, 199 were married (72%) and the remaining 79 (28%) were unmarried (Table 1). Few patients were able to study beyond secondary school level (21%) with only 4% achieving university degree, while 36% were illiterate (Table 1). Regarding occupation status, 20% were unemployed and among those employed, 44% were farmers and manual labourers (Table 1). Poisonings due to suicide (79%) outnumbered accidental poisoning cases (14%) by a wide margin (Table 2). Majority of the poisoning incidents (69%) occurred between 12 noon till midnight, while a very few poisoning incidents (8%) occurred from midnight till 6 a.m (Table 3). More than half of the poisoning cases (51%) reached the hospital within 2 hours from the reported time of poisoning, while a very few (2%) took more than 24 hours for the same (Table 4). Highest number of poisoning cases were due to intake of organophosphorous compounds (41%), followed by drug overdose in 36% cases (Table

Table 1. Sociodemographic characteristics of the patients

Characteristics	Males n (%)	Females n (%)	Total n (%)
Range of ages (Years)			
18 to 30	87 (31)	59 (21)	146 (52)
31-40	41 (15)	26 (9)	67 (24)
41-50	18 (6)	15 (5)	33 (11)
51-60	11 (4)	7 (3)	18 (7)
>60	5 (2)	9 (3)	14 (5)
Marital status			
Married	123 (44)	76 (27)	199 (71)
Unmarried	39 (14)	40 (14)	79 (28)
Literacy status			
Illiterate	47 (17)	52 (19)	99 (36)
Primary	54 (19)	24 (9)	78 (28)
Secondary	25 (9)	18 (6)	43 (15)
High school	16 (6)	12 (4)	28 (10)
Pre-university	12 (4)	7 (3)	19 (7)
Degree	8 (3)	3 (1)	11 (4)
Occupation			
Manual labourers	49 (18)	25 (9)	74 (27)
Farmers	33 (12)	13 (5)	46 (17)
Students	29 (10)	18 (7)	47 (17)
Job holders	12 (4)	6 (2)	18 (6)
Homemakers	0 (0)	37 (13)	37 (13)
Unemployed	39 (14)	17 (6)	56 (20)
Total	162 (58)	116 (42)	278 (100)

5). The other poisonings were due to intake of rodenticides (9%), house cleaning agents (6%), mosquito repellent (4%), corrosives (1%) and kerosene (1%) (Table 5). A few cases of snake bite poisonings (2%) were seen in farmers bitten accidentally while working in the fields (Table 5). Among the drug poisonings, benzodiazepine overdose was most common, contributing to 9% of the total cases, followed by overdose of non-steroidal anti-inflammatory drugs (4%) (Table 5). The emergency department received large percentage of the poisoning cases (46%) in the summer months of May, June and July, while it received less percentage (17%) of cases in the winter months of November, December and January. However, only 4 percent of poisoning cases presented to the hospital during the month of October (Figure 1). Most of poisoning cases (77%) were cured and discharged from the hospital within 3 days of admission, while only 3% cases were not discharged until a week from the day of admission (Table 6).

Table 2. Manner of poisoning – intentional or accidental

Manner of poisoning	Frequency	Percent
Suicidal intention	221	79
Accidental	39	14
Unknown	18	6

Table 3. Time of the poisoning incident

Time of incident	Total number of cases	Percent
12 midnight to 6 a.m.	23	8
6 a.m. to 12 noon	49	18
12 noon to 6 p.m.	112	40
6 p.m. to 12 midnight	82	29
Don't know	12	4

Table 4. Time interval between the poisoning incident and hospitalization.

	Number of cases	Percent
<2 hours	141	51
2-6 hours	95	34
6-24 hours	37	13
>24 hours	5	2

DISCUSSION

Of the 278 patients, 146 (52%) belonged to the 18 to 30 range of ages, which was similar to the findings from a previous study from south India which showed 50% patients who were aged between 18 and 30.¹⁴

Most (79%) poisoning cases were suicidal in nature (Table 2), which is similar to finding from another south Indian study reporting 69% suicidal poisonings.¹⁵ However, a similar study reported a much higher percentages of suicidal poisonings (93%).¹⁶

Male to female poisoning ratio was 1.38, which is less when compared to a previous study (1.68).¹⁷ The high male to female ratio in such studies may be attributed to the fact that males in India, being the earning members of the family, were exposed to more stress, financial issues and occupational hazards when compared to females. Also, males are known to have higher risk-taking behaviour as well as easier access to poisoning agents. (Table 1).^{18, 19}

A larger percentage (72%) of cases were married (Table 1), which resembles the findings

Table 5. Toxic agents/ drugs consumed by patients

Poison Type	No. of patients	Percent
Insecticides (Organophosphates)	114	41
Drug overdoses		
Sedative and hypnotics	25	9
NSAIDs	12	4
Antidiabetic drugs	12	4
Thyroxine	11	4
Antihistamines	9	3
Antidepressants	6	2
Antipeptic ulcer drugs	6	2
Antipsychotics	4	1
Antihypertensives	2	1
Bronchodilators	2	1
Multivitamins	2	1
Unknown drugs	10	4
Total drug overdoses	101	36
Rodenticides	24	9
House cleaning and bleaching agents	17	6
Mosquito repellents	11	4
Snake bite	5	2
Corrosives - acids and alkalis	3	1
Kerosene	3	1
Total	278	100

Table 6. Duration of hospital stay

Length of stay	Number of cases	Percent
1-3 days	213	77
4-6 days	58	21
≥ 7 days	7	3

from two similar studies showing 67% and 78% of married cases.^{20,21} In India, married people are at increased risk of suicide due to financial stress and increasing marital discord. This is in contrast to western countries, where marriage is considered to be protective against suicide.²²

More than third (36%) of the patients were illiterate (Table 1), which also corresponds to the findings from a similar study (31%).²³

Unemployment, seen in 20% cases is another likely cause for the poisonings (Table 1).

A large percentage (44%) of the cases worked as farmers and agricultural labourers (Table 1) who handled insecticide on a daily basis, which explains the reason for insecticide being the poisoning agent in 41% of cases (Table 5).

More than half (51%) of cases reported to the hospital within two hours of ingestion of poison (Table 4), which is similar to the findings from a previous study (52%).²⁴ The time interval between poison intake and hospitalization is crucial for better treatment outcome of poisoning patients. Treatment should be started as early as possible, ideally within two hours of the poisoning incident.^{25,26}

A greater percentage (46%) of poisoning cases presented to the emergency department in the summer season, with highest numbers in June (17%), followed by the months of May (15%) and July (14%). However, fewer poisoning cases (17%) presented to the emergency department during the winter season i.e. November (5%), December (6%) and January (6%). (Figure 1). A similar study from south India showed highest number of cases in May (27%).²⁷ This increase in number of suicide cases in the months of summer may be attributed to the fact that serotonin levels are relatively high in summer. An increased serotonin level thus increases the impulsivity and aggressive behaviour of the person, altering his decision making process and thereby facilitating him to commit suicide.²⁸

Most of the poisonings were due to

ingestion of organophosphates (41%), which is similar to findings from a previous study (40%).²⁹ A recent study reported a much higher number at 73%.³⁰

The next causative factor responsible for poisoning was drug overdose (36%) (Table 5), which is close to a previous study (43%).³¹ Benzodiazepine toxicity (9%) was most common followed by paracetamol toxicity (4%) (Table 5). All the drug toxicities were due to intentional over-dosing with the prime purpose of carrying out suicide (Table 5).

The timing of poisoning incident was known in 88% cases only (Table 3). Poison intake in most (40%) of the cases were reported in the time period from 12 noon to 6:00 p.m. in the evening (Table 3), which is similar to a previous study from south India (37%).³² This choice of poisoning pattern resembled the findings from another study which suggested that, those who intended to die for sure were more likely to select the evening and night hours for ingesting the poison, when their family members are less vigilant. This was in contrast to other individuals who attempted suicide with no intention to die, thereby chose less poisonous substances and day time when their cry for help can be easily heard and health care is also easily available to save them. Such cases had passive suicidal ideation and mostly ended up in an attempted suicide. It was also suggested that those who attempt suicide without an intention to die, do so mostly in the afternoon hours, when the brain adrenergic and serotonergic activities are low, which causes depressive mood changes.^{33,34}

Majority (77%) of the cases after initial stabilisation were admitted in internal medicine department and were later discharged after recovery within three days, while a very few (3%) discharged after eight days (Table 6), which is similar to a previous study in which 71% cases were discharged within 3 days.³⁵

The present study has highlighted that most poisonings reported to the emergency department were suicidal in nature. The results obtained from this study have given us an insight into characteristics of the population at risk for suicide with regards to their socio-demographics. Organophosphates (insecticides) were the most common poisoning agents used by farmers because of their easy availability. Inadequate

education coupled with unemployment seemed to be the reason for poisoning in several cases. The information obtained from this study facilitated in identifying patient characteristics which are the risk factors for suicide like unemployment, illiteracy, younger age and male gender. Suicide may be prevented by undertaking adequate psychological counselling for those who are at increased risk for suicide, particularly younger married males who are unemployed and less educated. The *insecticide registrars and regulatory bodies need to implement guidelines proposed by World Health Organization in reinforcing the use of low risk insecticides, registration of insecticides and regulatory control over utilization and storage of insecticides.*³⁶ In order to prevent poisonings due to drug overdose, the drug regulatory authorities are required to implement stringent control of the unchecked sale of over the counter and prescription drugs. This study also made us realize the importance of establishing poison information centre at the present hospital to help provide information to the poisoning suspects and to sufficiently address their queries for the prompt diagnosis and management of toxicities, even at primary healthcare level.

CONCLUSION

Organophosphate ingestion and drug overdosing were the most prevalent type of poisoning, majority being of suicidal intent. Poisoning occurrence was high among married men and in patients aged below 30. Poisoning incidents most often occurred during days of summer. Developing and implementing effective poisoning prevention strategies and its management protocols are required. Limitation of the present study was that being a one year and a single hospital study, the findings are not reflective of a general profile of poisoning from the whole region. Also, the number of cases included during this period might vary from actual number from this region, due to underreporting. There was also possibility of misdiagnosis, since the poisonings reported were not confirmed with serum analysis and that the only source of information about the causative poisoning agent was provided by the patient or the patient's family member. Hence, a multicenter study for a longer duration is recommended to achieve

a comprehensive pattern of acute poisonings occurring in south India.

ACKNOWLEDGEMENTS

Authors wish to acknowledge the staff of emergency department for their cooperation and support.

Conflict of interest

There is no conflict of interest.

Funding source

This study has no funding source

REFERENCES

1. World health organization. International Programme on Chemical Safety, Poisoning Prevention and Management. 2020. Available in: <https://www.who.int/ipcs/poisons/en/>
2. Peiris-John R, Kafoa B, Wainiqolo I, Reddy RK, McCaig E, Ameratunga SN. Population-based characteristics of fatal and hospital admissions for poisoning in Fiji: TRIP Project-11. *Inj Prev* 19: 355-7 (2013).
3. Pillay VV. Textbook of Forensic Medicine and Toxicology. 17th ed. Paras Publication, Hyderabad: 470-496 (2016).
4. Devi S. Toxicology, general consideration. In: Reddy NKS. Essentials of Forensic Medicine and Toxicology. 33rd ed. Jay Pee Brothers, Hyderabad: 446-465 (2014).
5. National crime records bureau. Suicides in India, Chapter -2. Government of India, National crime records bureau; 2012. Available in: <http://ncrb.gov.in/StatPublications/ADSI/ADSI2012/suicides-11.pdf>
6. Pillay VV. MKR Krishnan's Hand book of Forensic Medicine and Toxicology. 12th ed. Paras Publication, Hyderabad: 276 – 299 (2001).
7. Taruni NG, Bijoy TH, Momonchand A. A profile of poisoning cases admitted to RIMS Hospital Imphal. *J Forensic Med Toxicol* 18: 31-33 (2001).
8. Sharma BR, Harish D, Sharma V et al. The epidemiology of poisoning: an Indian View point. *J Forensic Med Toxicol* 14: 51 (1997).
9. Gargi J, Tejpal HR. A retrospective autopsy study of poisoning in the northern region of Punjab. *J Punjab Acad Forensic Med Toxicol* 2: 17-20 (2008).
10. Abd-Elhaleem ZAE, Muqhem BAA. Pattern of acute poisoning in Al Majmaah region, Saudi Arabia. *Am J Clin Exp Med* 2(4): 79-85 (2014).
11. Aaron R, Joseph A, Abraham S, Muliylil J, George

- K, Prasad J *et al.* Suicides in young people in rural southern India. *Lancet* **363**: 1117-8 (2004).
12. Sikary A. Homicidal poisoning in India: A short review. *J Forensic Leg Med* **61**: 13-16 (2019).
 13. Gunnell D, Knipe D, Chang SS, *et al.* Prevention of suicide with regulations aimed at restricting access to highly hazardous pesticides: a systematic review of the international evidence. *Lancet Glob Health* **5**(10): 1026-1037 (2017).
 14. Reddy BS, Skaria TG, Polepalli S, Vidyasagar S, Rao M, Kunhikatta V *et al.* Factors associated with outcomes in organophosphate and carbamate poisoning: a retrospective study. *Toxicol Res* **36**: 257-266 (2020).
 15. Singh OG, Singh AM. Trends of poisoning cases in Melmaruvathur region of Tamil Nadu: A retrospective study of 3 years. *Int Arch Integr Med* **4**: 27-31 (2013).
 16. Mahabalshetti AD, Aithal KR, Patil BS, Kudari SS, Dhananjaya M. Profile of acute poisoning cases at a tertiary care hospital. *Med Inn* **2**: 81-86 (2013).
 17. Prayag A, Ashtagi GS, Mallapur MD. Pattern of poisoning cases at a tertiary health-care center, Belagavi. *Int J Med Sci Public Health* **5**: 1698-1701 (2016).
 18. Srivastava A, Peshin SS, Kaleekal T, Gupta SK. An epidemiological study of poisoning cases reported to the National Poisons Information Centre, All India Institute of Medical Sciences, New Delhi. *Hum Exp Toxicol* **24**: 279-285 (2005).
 19. Kiran N, Shobharani RH, Jaiprakash V, Vanaja K. Pattern of poisoning reported at south Indian tertiary care hospital. *Indian J Forensic Med Toxicol* **2**(2): 17-19 (2008).
 20. Maharani B and Vijayakumari N. Profile of poisoning cases in a Tertiary care Hospital, Tamil Nadu, India. *J App Pharm Sci* **3**(1): 91-94 (2013).
 21. Siva S, Reddy T, Fayaz S, Durga TS. Pattern of acute poisoning, therapeutic approach and outcomes in south Indian tertiary care teaching hospital, Andhra Pradesh. *Int J Univsal Pharmacy Bio Sci* **4**: 67-78 (2015).
 22. Radhakrishnan R, Andrade C. Suicide: An Indian perspective. *Indian J Psychiatry* **54**(4): 304-319 (2012).
 23. Siva S, Reddy T, Fayaz S, Durga TS. Pattern of acute poisoning, therapeutic approach and outcomes in south Indian tertiary care teaching hospital, Andhra Pradesh. *Int J Univsal Pharmacy Bio Sci* **4**: 67-78 (2015).
 24. Sarma PK, Chakraborty R. A clinical study of acute organophosphorous poisoning in a tertiary care hospital in north-east India with correlation of severity to prognosis. *Paripex – Indian J Research* **8**:1 (2019).
 25. Usha M, Satish Kumar BP, Shahin Maria J, Ebru Joseph S, Laxman W. Developing a standard treatment protocol towards Organophosphorus poisoning for emergency department in a hospital. *India. J Basic Clin Pharma* **8**: 64-71 (2017).
 26. Tipathi KD. Essentials of Medical Pharmacology. 7th Edition. New Delhi, India: Jaypee Brothers Medical Publishers; 2013:110-111
 27. Gopinath V, Padmakumar K. Profile and pattern of poisoning cases reported in a tertiary care teaching hospital in Kerala. *Indian J Forensic Community Med* **4**(3): 185-188 (2017).
 28. Dsouza A, Venkat S. Seasonality of Suicidal Behavior in Mysuru, Karnataka, India: A Populace Based Analysis. *Malays J Psychiatry* **28**: 2 (2019).
 29. Jesslin J, Adepu R, Churi S. Assessment of prevalence and mortality incidence due to poisoning in a south Indian tertiary care teaching hospital. *Indian J Pharm Sci* **72**(5): 587-591 (2010)
 30. Patnaik AMM, Jagadeesh MN, Narayana RV, Lakshmi, Kumar CH, Mahapatra SC. A study of pattern of poisoning cases admitted to Maharaja Institute of Medical Sciences, Vizianagaram, South India. *Journal of Indian Academy of Forensic Medicine* **38**: 182 (2016).
 31. Anthony L, Kulkarni C. Patterns of poisoning and drug overdosage and their outcome among in-patients admitted to the emergency medicine department of a tertiary care hospital. *Indian J Crit Care Med* **16**(3): 130-135 (2012).
 32. Srinivasa K, Yadukul S, Madyastha M. Study of profile of poisoning cases reported to district hospital, Chamarajanagar, Karnataka, India. *Int J Basic Clin Pharmacol* **5**: 1215-1219 (2016).
 33. Manfredini R, Gallerani M, Caracciolo S, Tomelli A, Calo G, Fersini C. Circadian variation in attempted suicide by deliberate self-poisoning. *BMJ* **309**: 774-775 (1994).
 34. Roy A, Linnoila M. Suicidal behavior, impulsiveness and serotonin. *Acta Psychiatr Scand* **78**: 529-535 (1988).
 35. Bamathy B, Punnagai K, Amritha CA, Chellathai DD. Incidence & Patterns of Acute Poisoning Cases in an Emergency Department of a Tertiary Care Hospital in Chennai. *Biomed Pharmacol J* **10**(3): 1285-1291 (2017).
 36. World health organization. Preventing suicide: a resource for pesticide registrars and regulators. 2020. Available in: <https://apps.who.int/iris/bitstream/handle/10665/326947/9789241516389-eng.pdf>