Bibliometric analysis of adverse drug reactions and pharmacovigilance research activities in Nepal

Sunil Shrestha, Krisha Danekhu, Bhuvan KC, Subish Palaian and Mohamed Izham Mohamed Ibrahim

Abstract

Background: Bibliometric analyses have been used previously to study the measures of quality and impact of research performed in several health-related areas such as adverse drug reactions (ADRs) and pharmacovigilance (PV), etc. This method can assess the research performance of publications quantitatively and statistically. There is no evidence of bibliometric studies analyzing ADRs and PV from Nepal. Therefore, the present study aimed to assess scientific output on ADRs and PV-related research activities in Nepal using a bibliometric analysis of publications from 2004 January to December 2018, that is, 15years.

Methods: A systematic search was conducted in PubMed, Web of Science, Google Scholar, Scopus and Nepal Journal Online (NepJOL) databases. ‘Adverse Drug Reactions’ or ‘ADRs’ or ‘ADR’ or ‘Adverse drug reaction’ or ‘AE’ or ‘Adverse Event’ or ‘Drug-Induced Reaction’ or ‘Pharmacovigilance’ or ‘PV’ and ‘Nepal’. The search covered 15years (January 2004 to December 2018) of study on ADRs and PV in Nepal. Only articles retrieved from databases were included, whereas published/unpublished drug bulletins, pharmacy newsletters and thesis were excluded. The articles thus retrieved were recorded, and thereafter analyzed. Word count code was used for the analysis of keywords used in the retrieved articles.

Results: A total of 124 articles were retrieved, with the highest rate of publications in 2006 and 2007, with 16 papers each. Among the articles, 10 (8.1%) were published in Kathmandu University Medical Journal (KUMJ). Single papers were published in 38 different journals. Brief reports (1.6%), case reports (31.2%), case series (0.8%), education forums (0.8%), letters to the editor (5.6%), original research articles (41.9%), review articles (9.7%), short communications and short reports (8.1%) on ADRs and PV were recorded. Out of 124 papers, 52 (41.9%) were original research publications. The majority (74.1%) of research was done in the category of ADR incidence, types, prevention, and management, followed by policy and suggestions for strengthening national and regional pharmacovigilance centers of Nepal (14.5%).

Conclusions: During the study years, there was an increase in scientific publications on drug safety. A total of 124 published articles were found during bibliometric analysis of ADRs and PV research activities in Nepal.

Keywords: adverse drug reactions, bibliometry, drug safety, Nepal, pharmacovigilance

Introduction

Adverse drug reactions (ADRs) are ‘a response to a medicine which is noxious and unintended, and which occurs at doses normally used in man’. Globally, ADRs are significant cause underlying morbidity and mortality in hospital. The World Health Organization (WHO) has set up a pharmacovigilance (PV) unit and developed a PV strategy.
to coordinate ADR detection, reporting, and monitoring at a global level, which is managed through the Uppsala Monitoring Center (UMC) based in Sweden. PV is defined as ‘the science and activities relating to the detection, assessment, understanding, and prevention of adverse effects or any other possible drug-related problems’. For healthcare organizations and providers, PV is a program to monitor the adverse effects of medications and prevent its occurrence in patients, and to promote patient safety and wellbeing. Nepal joined the WHO Pharmacovigilance program in July 2006. A National Pharmacovigilance Center was set up at the Department of Drug Administration (DDA) to monitor PV activities in Nepal. Presently, there are 15 regional PV centers in Nepal. As of now, 831 ADR reports have been reported to the National Pharmacovigilance Center at the DDA.

Several studies have been performed in Nepal on ADRs and PV. Review and analysis of these studies will enhance the understanding of PV in Nepal, and suggest ways to improve PV practice.

As bibliometric analysis measures the quality and impact of research yields, it might be helpful to obtain information on ADR reporting and the various activities run by PV centers in Nepal. Evaluation is generally performed by measuring different metrics such as citation counts, H-index, field-weighted citation impact, outputs in top percentiles, journal impact factor, cite score, SCImago journal rank, and Scopus SNIP.

Only a limited number of bibliometric analyses regarding medication errors and adverse drug events have been carried out. Hung-HC reported a bibliometric analysis of medication errors and adverse drug events studies from 1961 to 2013. The database search revealed 3343 and 3342 documentations of medication errors and adverse drug events, respectively. Similarly, utilizing bibliometric visualization techniques, Rodrigues et al. carried out a study that analyzed the pattern of literature in patient safety that suggests research directions for the future. The latter study showed the frequency of published articles and types of publications regarding PV and ADRs, whereas our present study focuses on the impact of those published papers in different journals.

Bibliometric review is different from systematic review, and is considered a good tool for the evaluation of the pattern and advancement of research activities in a certain field over a period of time utilizing the literature system and available literature in certain area as research objects, and breaking down the literature quantitatively and qualitatively. Bibliometric analysis examines bibliographical works within a specific field, theme, institution, or nation-state. It can depict changes and developments in a specific field over a period of time through the analysis of research publications in that field during that given time. This can be useful for investigators in assessment of research results, finding gaps, and suggesting that more research be carried out in areas that have not yet been explored, or for future pathways.

In Nepal, not much information is available on PV research and other activities. One can find studies on PV in Nepal in different Nepalese and international journals. However, no information is available on the nature, pattern, outcomes, and other details of such studies. As a result, the state of PV research, research gaps, and practical recommendations to improve PV practice are lacking. To our knowledge, this is the first effort from the Nepalese pharmacy sector to use a bibliometric approach to explore PV- and ADR-related research activities in Nepal. This bibliometric analysis is important in the field of pharmacy practice since it will provide a comprehensive overview of at current research trends on PV and ADRs in Nepal.

Methods

Study design

This study is a bibliometric review of PV and ADRs in Nepal.

Search strategy and database used

A systematic search was conducted in PubMed, Web of Science (WoS), Google Scholar, Scopus, and Nepal Journal Online (NepJOL) databases using the search terms ‘Adverse Drug Reactions’ or ‘ADRs’ or ‘ADR’ or ‘Adverse drug reaction’ or ‘AE’ or ‘Adverse Event’ or ‘Drug-Induced Reaction’ or ‘Pharmacovigilance’ or ‘PV’ and ‘Nepal’. The search terms included terms describing and covering all fields in PV and ADRs using MeSH terms in PubMed (Table 1) combined with ‘Nepal’. A systematic search utilizing both Nepali and English databases was performed.
The search covered the period from January 2004 to December 2018 using Medline/PubMed, Index Copernicus, Web of Science, and Scopus. Google and Google Scholar search engines were also used. The Nepalese electronic database included was NepJOL, where 150 journals are listed.

**Inclusion and exclusion criteria**

Different article types, such as original research articles, case reports, review articles, short communications, letters to the editor, brief reports, case series, and education forums by Nepalese authors are included in this study. Articles in the English language, with publication dates between January 2004 and December 2018, relevant to PV and ADRs, and research (or review) based on the Nepalese scenario, were included.

Drug bulletins, articles not published in online journals, online pharmacy newsletters, conference presentations, etc. were excluded. No manual search was performed in libraries of different universities. Papers published in local language were also excluded. We excluded papers published before January 2004 and after December 2018. A flowchart of the operational framework of a bibliometric study is shown in Figure 1.

**Data collection and validation**

On the basis of inclusion and exclusion criteria, two authors independently extracted data from all included publications, including titles, keywords, publication dates, authors, publishing journals, sum of citations, H-index, and so on. The information obtained from the different database were entered in MS-Excel 2010. All the information is again checked and screened by the other two authors. For the validity of the search strategy, two co-authors manually reviewed the 124 articles from the study period.

### Table 1. MeSH keywords (for search in electronic databases both in English).

- Adverse Drug reaction
- ADRs
- ADR Reporting
- Adverse Events
- AEs
- Case report
- Drug-Induced
- Drug-Induced reaction
- Drug Safety
- Pharmacovigilance
- PV
- Reporting

On the basis of the main objectives(s) of the study, articles were classified by two independent reviewers into five categories:

1. ADRs (incidence, types, prevention and management);
2. policy and suggestions for strengthening national and regional PV centers of Nepal;
3. knowledge, attitude, and practice of PV and ADR among healthcare professionals and consumers;
4. PV and ADR educational interventions among health care professionals and consumers; and
5. drug withdrawal due to ADRs.

### Data analysis and visualization

Databases were exported to Excel, and then to IBM SPSS Statistics 26 software package (IBM Corp. Release 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp.). Descriptive analyses of key descriptive study variables were also conducted and are summarized in the tables and figures.

The data exported included:

- title of journal,
- title of paper,
- author’s name,
- number of authors,
- published year,
- keywords,
- journal impact factor (IF),
- International Standard Serial Number (ISSN), and
- H-index of the journals

ADR incidence, types, prevention, and management is further divided into domains:

i. Cutaneous adverse drug reactions;
ii. ADRs due to generally prescribed drugs;
iii. ADRs related to antitubercular medicines;
iv. ADRs related to chemotherapy drugs;
v. ADRs due to antihypertensive medicines;
Figure 1. Flowchart of the operational framework of a bibliometric study.
vi. ADRs related neuropsychiatric manifestations;
vii. ADRs due to antileprotic medicines;
viii. ADRs related to antileprotic medicines;
ix. ADRs related to oral hypoglycemic agents;
x. ADRs due to anti filarial medicines; and
xi. others [ADRs such as hematological reactions, gastrointestinal (GI) distress].

Analysis of keywords obtained from all articles included in this study was done using the Word Cloud generator.

Ethical approval
The data were downloaded from numerous databases such as PubMed, Scopus, and secondary data. The study did not involve any interactions with human subjects or human materials. There were no ethical questions about the data. Approval of an ethics committee was not necessary.

Results
A total of 124 articles were reviewed and analyzed.

Annual number of ADRs and PV publications in Nepal
Figure 2 shows the distribution of papers on PV and ADRs by year of publication. Of the articles retrieved, it was found that the years 2006 and 2007 recorded the highest number of publications, that is, 16 publications, whereas in 2004 there were only two publications. The increase in the number of articles published in the period under consideration is shown in Figure 2.

Average author per article
The average number of authors per paper was 4.10 (standard deviation (SD) = 1.68); 28 papers were authored by 3 authors, whereas 1 paper was written by 10 authors. Only three articles were written by a single author. Table 2 lists the average number of authors per article.

List of journals with frequency of papers published with IF, ISSN, and H-Index
The distribution of different journals (n = 63) in which the reviewed articles appeared, papers with journal impact factor, and ISSN are listed in Table 3. The highest number of articles were published in the Kathmandu University Medical Journal (KUMJ; 8.0%) followed by the Journal of Institute of Medicine (JIOM; 5.6%). A total of 38 single papers were published in different scientific journals. Online search was performed using Scientific Journal Ranking (SJR) for searching ISSN, H-index number, and SJR factor or impact factor of the journal. For those journals not found on SJR website, the journal homepage containing ISSN and impact factor was considered. Those not found in SJR or journal page were listed as not available (NA).

Different types of publications recorded
Different types of articles were recorded, as shown in Table 4. Brief reports, case reports, education forums, letters to the editor, original research articles, review articles, short communications, and short reports on ADR and PV were published. The number of original research articles published was 52 (41.9%), followed by 39 (31.2%) case reports.

Research categories and research domains
The different types of articles published in different categories and research domains are shown in Table 5. Most (74.1%) research was done in the category of ADRs (incidence, types, prevention and management) followed by policy, and suggestions for strengthening national and regional PV centers of Nepal (14.5%).

Analysis of keywords using the Word cloud generator
The image generated based on the keywords extracted from the articles using Word cloud generator can be seen in Figure 3. As an example, keywords like ‘adverse drug reactions’, ‘pharmacovigilance’ and ‘Nepal’ appear larger than other words, demonstrating that they have been mentioned in the articles most commonly.

Discussion
The results of this study show that 124 articles were published in different journals covering ADR and PV in the Nepalese context. This is the output from the past 15 years, covering 2004 to 2018, and is the first article analyzing the bibliometric of ADR and PV in Nepal.
Only 52 articles were original research articles based on the practice of PV in Nepal. The annual number of publications varied and was skewed over the years, with only two papers in the year 2004 and 16 publications in the year 2006 and 2007. Pattern of ADR reporting, especially to the regional PV centers and teaching hospitals, has been quite consistent. However, studies on different aspects of ADR and PV have not been carried out in a similar fashion. This may be because not all secondary and tertiary hospitals have PV centers of their own and PV has not received the research focus it should.

Most of the articles were descriptive in nature and were published in Nepalese journals, none of which have an impact factor. Furthermore, some of these journals were also non-indexed. None of the studies involved randomized controlled trials or were interventional studies. It shows that more rigorous studies with sound research designs are required to evaluate the overall state of PV and ADR in Nepal and improve it further.

Analyses of the keywords of these articles showed that the focus of the articles was on PV, ADR, Nepal, consumers, adverse effect, chemotherapy, antibacterial agents, casualty assessment, Naranjo algorithm, etc. The articles were focused on the PV programs and ADR assessment, reporting, ADRs due to antibiotics, chemotherapy and other medicines, and consumer and community involvement in the PV process.

By and large, there is a need to carry out more studies on ADR and PV in Nepal to improve the state of PV and promote quality use of medicines.

**Table 2.** Average number of authors per article.

| Average number of authors | Frequency (n) | Percent (%) |
|---------------------------|--------------|-------------|
| 1                         | 3            | 2.4         |
| 2                         | 20           | 16.1        |
| 3                         | 28           | 22.6        |
| 4                         | 24           | 19.4        |
| 5                         | 24           | 19.4        |
| 6                         | 15           | 12.1        |
| 7                         | 7            | 5.6         |
| 8                         | 2            | 1.6         |
| 10                        | 1            | 0.8         |
| **Total**                 | **124**      | **100.0**   |

**Figure 2.** Annual number of ADR and PV publications in Nepal. ADR, adverse drug reaction; PV, pharmacovigilance.

**Strengths and limitations of this study**

To the authors’ knowledge, this study is the first bibliometric research to assess research activity in the field of PV and ADRs conducted in Nepal. This research highlights trends in drug safety research patterns in Nepal. However, this study has a number of limitations, which need to be listed. First, this study is limited only to research activities of PV and ADRs conducted in the country of Nepal, and PV activities in Nepal are still in
Table 3. List of journals with IF and ISSN.

| Sample number | Name of journal                                               | Frequency | Percent | Journal impact factor/SJR | ISSN                        | H-index |
|---------------|---------------------------------------------------------------|-----------|---------|---------------------------|-----------------------------|---------|
| 1             | Acta Dermatovenerol APA                                       | 1         | 0.8     | NA                        | NA                          | NA      |
| 2             | American Journal of Pharmaceutical Education                | 1         | 0.8     | 0.62/Q1                   | 00029459, 15536467          | 49      |
| 3             | Annals of Pharmacotherapy                                    | 1         | 0.8     | 1.1/Q1                    | 15426270, 10600280          | 100     |
| 4             | Archives of Pharmacy Practice                                | 1         | 0.8     | 0.1/Q4                    | 2045080X                    | 1       |
| 5             | Asia Pacific Allergy                                         | 1         | 0.8     | 0.62/Q2                   | 22338276, 22338268          | 3       |
| 6             | Asian Journal of Medical Sciences                            | 1         | 0.8     | NA                        | 2467-9100, 2091-0576        | NA      |
| 7             | Australasian Medical Journal                                 | 5         | 4.0     | 0.32/Q2                   | 18361935                   | 16      |
| 8             | BMC pharmacology & toxicology                                | 1         | 0.8     | 0.78/Q2                   | 20506511                   | 19      |
| 9             | BMC Research Notes                                           | 1         | 0.8     | 0.69/Q2                   | 17560500                   | 52      |
| 10            | Clinical Pharmacology: Advances and Applications             | 2         | 1.6     | 0.97/Q2                   | 11791438                   | 18      |
| 11            | Dermatology Online Journal                                   | 1         | 0.8     | 0.33/Q3                   | 10872108                   | 35      |
| 12            | Drug Information Journal                                     | 1         | 0.8     | NA                        | NA                         | NA      |
| 13            | Drug Safety                                                  | 1         | 0.8     | 1.45/Q1                   | 1145916                    | 112     |
| 14            | Health Renaissance                                           | 2         | 1.6     | NA                        | 1994-7208                  | NA      |
| 15            | Indian Journal of Psychological Medicine                     | 1         | 0.8     | 0.37/Q3                   | 09751564, 02537176          | 13      |
| 16            | Indian Journal of Pharmacology                               | 1         | 0.8     | 0.41/Q3                   | 19983751, 02537613          | 49      |
| 17            | International Journal of Basic & Clinical Pharmacology       | 1         | 0.8     | NA                        | 2279-0780                  | NA      |
| 18            | International Journal of Health Sciences and Research        | 1         | 0.8     | NA                        | 2249-9571                  | NA      |
| 19            | International Journal of Pharmaceutical & Biological Archives| 1         | 0.8     | NA                        | 2581-4303                  | NA      |
| 20            | International Journal of Pharmacovigilance                   | 2         | 1.6     | NA                        | 2476-2431                  | NA      |
| 21            | International Journal of Pharmacy                            | 1         | 0.8     | NA                        | 2249-1848                  | NA      |
| 22            | International Journal of Risk and Safety in Medicine         | 2         | 1.6     | 0.32/Q3                   | 9246479                    | 19      |
| 23            | Journal of BP Koirala Institute of Health Sciences           | 2         | 1.6     | NA                        | 2616-0323, 2616-0390        | NA      |
| 24            | Journal of Chitwan Medical College                           | 3         | 2.4     | NA                        | 2091-2412, 2091-2889        | NA      |
| 25            | Journal of Clinical and Diagnostic Research                  | 7         | 5.6     | 0.35/Q3                   | 0973709X                   | 22      |

(Continued)
| Sample number | Name of journal                                      | Frequency | Percent | Journal impact factor/SJR 2017 | ISSN | H-index |
|---------------|------------------------------------------------------|-----------|---------|-------------------------------|------|---------|
| 26            | Journal of College of Medical Sciences-Nepal         | 3         | 2.4     | NA                            | 2091-065, 2091-0673 | NA      |
| 27            | Journal of Gandaki Medical College-Nepal             | 2         | 1.6     | NA                            | 2070-4240 | NA      |
| 28            | Journal of Institute of Medicine                     | 7         | 5.6     | NA                            | 0259-0972 | NA      |
| 29            | Journal of Kathmandu Medical College                 | 1         | 0.8     | NA                            | 2091-1785, 2091-1793 | NA      |
| 30            | Journal of Lumbini Medical College                   | 1         | 0.8     | NA                            | 2542-2618, 2392-4632 | NA      |
| 31            | Journal of Nepal Health Research Council             | 1         | 0.8     | 0.15/Q4                       | 19996217 | 8       |
| 32            | Journal of Nepal Paediatric Society                  | 1         | 0.8     | 0.11/Q4                       | 19907974, 19907982 | 6       |
| 33            | Journal of Nepal Pharmaceutical Association          | 1         | 0.8     | NA                            | 0253-8261 | NA      |
| 34            | Journal of Nepalese Society of Periodontology and Oral Implantology | 1         | 0.8     | NA | 2863, 2565-4845 | NA |
| 35            | Journal of Oncology Pharmacy Practice               | 1         | 0.8     | 0.59/Q2                       | 1477092X, 10781552 | 26      |
| 36            | Journal of Pakistan Association of Dermatologists    | 6         | 4.8     | 0.18/Q3                       | 15609014 | 10      |
| 37            | Journal of Pharmacy Practice                         | 1         | 0.8     | 0.41/Q3                       | 8971900 | 21      |
| 38            | Journal of Pharmacy Practice and Research            | 2         | 1.6     | 0.16/Q3                       | 1445937X | 19      |
| 39            | Journal of Psychiatrists’ Association of Nepal       | 2         | 1.6     | NA                            | 2091-2862, 2350-8949 | NA |
| 40            | Journal of Society of Anesthesiologists of Nepal     | 2         | 1.6     | NA                            | 2362-1281, 2467-9119 | NA |
| 41            | Journal of the Nepal Medical Association             | 2         | 1.6     | 0.13/Q4                       | 282715 | 15      |
| 42            | Journal of the Pakistan Medical Association          | 1         | 0.8     | 0.28/Q3                       | 309982 | 35      |
| 43            | Kathmandu University Journal of Science, Engineering and Technology | 1         | 0.8     | NA                            | 1816-8752 | NA      |
| 44            | Kathmandu University Medical Journal (KUMJ)          | 10        | 8.1     | 0.17/Q3                       | 18122078, 18122027 | 20      |
| 45            | Medical Journal of Shree Birendra Hospital           | 1         | 0.8     | NA                            | 2091-0185, 2091-0193 | NA |
| 46            | Nepal Journal of Dermatology, Venereology & Leprology | 5         | 4.0     | NA                            | 2091-0231, 2091-167X | NA      |
| 47            | Nepal Journal of Epidemiology                        | 2         | 1.6     | NA                            | 2091-0800 | NA      |

Table 3. (Continued)
their infancy. We have not included drug bulletins or pharmacy newsletters, and we did not perform a manual search of thesis or projects undertaken by undergraduates, graduates, and PhD students in libraries of the different colleges and universities of Nepal. Second, the search strategy used in the current bibliometric study was held to be trustworthy and valid; however, the search strategy probably contained non-negligible errors that cannot be ignored completely. Third, the latest published articles, which were published after December 2018, have not been included in this study. It could have added to the study. Another significant limitation is that the keywords used might not be fully inclusive of

### Table 3. (Continued)

| Sample number | Name of journal                                           | Frequency | Percent | Journal impact factor/SJR 2017 | ISSN | H-index |
|---------------|----------------------------------------------------------|-----------|---------|-------------------------------|------|---------|
| 48            | Nepal Journal of Neuroscience                            | 1         | 0.8     | NA                            | 1813-1948, 1813-1956 | NA |
| 49            | Nepal Journal of Obstetrics and Gynaecology              | 2         | 1.6     | NA                            | 1999-9623, 1999-8546 | NA |
| 50            | Nepalese Heart Journal                                   | 2         | 1.6     | NA                            | 2091-2978, 2382-5464 | NA |
| 51            | Pakistan Journal of Pharmaceutical Sciences              | 3         | 2.4     | 0.36/Q2                       | 1011601X | 33 |
| 52            | Pharmacology online                                      | 4         | 3.2     | 0.16/Q4                       | 18278620 | 20 |
| 53            | Pharmacy Practice                                        | 3         | 2.4     | 0.45/Q2                       | 1885642X, 18863655 | 17 |
| 54            | Research in Social and Administrative Pharmacy           | 1         | 0.8     | 0.9/Q1                        | 15517411 | 33 |
| 55            | SAARC Journal of Tuberculosis, Lung Diseases & HIV/AIDS | 2         | 1.6     | NA                            | 1818-9741, 2091-0959 | NA |
| 56            | Saudi Pharmaceutical Journal                             | 1         | 0.8     | 0.69/Q1                       | 13190164 | 30 |
| 57            | Southern Med Review                                      | 1         | 0.8     | NA                            | NA   | NA |
| 58            | The International Journal of Risk and Safety in Medicine | 1         | 0.8     | 0.32/Q3                       | 9246479 | 19 |
| 59            | The Internet Journal of Dermatology                     | 2         | 1.6     | NA                            | 1531-2976 | NA |
| 60            | Timisoara Medical Journal                               | 1         | 0.8     | 0                            | 1583526X, 15835251 | 4 |
| 61            | Tropical Doctor                                          | 1         | 0.8     | 0.33/Q3                       | 494755 | 30 |
| 62            | Value in Health                                          | 2         | 1.6     | 1.78/Q1                       | 15244733, 10983015 | 82 |
| Total         |                                                          | 124       | 100.0   |                               |      |         |

NA, not available; –, not given. IF, impact factor; ISSN, international standard serial number; SJR, scientific journal ranking.

### Table 4. Type of publications recorded.

| Type of publication         | Frequency | Percent |
|-----------------------------|-----------|---------|
| Original research article   | 52        | 41.9    |
| Case report                 | 39        | 31.2    |
| Review article              | 12        | 9.7     |
| Short communication         | 10        | 8.1     |
| Letter to editor            | 7         | 5.6     |
| Brief report                | 2         | 1.6     |
| Case series                 | 1         | 0.8     |
| Education forum             | 1         | 0.8     |
| Total                       | 124       | 100     |
possible keywords and there is the possibility of false-positive and false-negative outcomes. Nevertheless, the authors did their best to validate the data by reviewing manually, and tried to make an inclusive assessment of PV and ADRs research productivity in Nepal that ideally will be a positive and progressive expansion to the literature on PV and ADRs.

**Take-home messages**

As the significant focus of this study was Nepal only, our future research plan and our recommendations for the scientific community who are interested in ADRs and PV are as follows. First, a need to carry out in-depth systematic reviews of the literature by PV categories, ADR categories, by adverse events categories, by other categories (e.g. drug–drug interactions, medication errors), and by geographical demarcation (e.g. pharmacovigilance and ADR reporting activities within the South Asia or Asia region). Geographical demarcation need not be limited to any specific region; the PV activities of the world can be taken. Second, drug safety is an important area and Nepalese healthcare professionals should be aware of the noxious effects of drugs. Drug regulatory authorities like the DDA as well as consumers also need to be aware of safe drug use. Awareness of drug safety among all stakeholders, such as healthcare providers, regulatory authorities and consumers, aids in early detection and prevention of ADR. Furthermore, studies on different aspects of the ADR process, monitoring and outcomes can provide insights into the state of PV in Nepal and can provide recommendations for further improvements. Third, healthcare professionals and policymakers should focus on PV and ADR reporting so that the national PV system can be improved and the quality use of medicines can be promoted. Fourth, there is an increase in collaborative work in research and it is important to analyze links

| Sample number | Category                                                                                                                                       | Research domains                                                                 | n   | %   |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----|-----|
| 1. ADRs (incidence, types of therapeutic categories, prevention and management) | Cutaneous adverse drug reactions                                                                                                             | 33  | 37.5|
|               | ADRs due to generally prescribed drugs                                                                                                        | 12  | 13.63|
|               | ADRs related to antitubercular medicines                                                                                                     | 11  | 12.5|
|               | ADRs related to chemotherapy drugs                                                                                                            | 5   | 5.7 |
|               | ADRs due to antihypertensive medicines                                                                                                        | 5   | 5.7 |
|               | ADRs related neuropsychiatric manifestations                                                                                                 | 3   | 3.4 |
|               | ADRs due to antileprotic medicines                                                                                                            | 2   | 2.2 |
|               | ADRs related to oral hypoglycemic agents                                                                                                      | 1   | 1.1 |
|               | ADRs due to anti filarial medicines                                                                                                           | 1   | 1.1 |
|               | Others therapeutic categories                                                                                                                 | 15  | 17.0|
| 2. Policy and suggestions for strengthening national and regional pharmacovigilance centers of Nepal |                                                                                                                                           | 18  | 14.5|
| 3. Knowledge, attitude and practice of pharmacovigilance and ADR among healthcare professionals and consumers |                                                                                                                                           | 6   | 4.8 |
| 4. Educational intervention health care professionals and consumers pharmacovigilance and ADR among |                                                                                                                                           | 7   | 5.6 |
| 5. Drug withdrawal due to ADRs                                                                                                                |                                                                                                                                           | 1   | 0.8 |

ADR, adverse drug reaction.
between scientific researchers in different countries. Further, investments in research should be increased in international research collaborations, and research networks should be encouraged to prioritize research in drug safety. Finally, the results of this study will form a useful baseline to be used by scientific researchers globally. During this bibliographic research, authors could not find articles related to transnational PV with information on new drug safety signals and regulatory actions. Hence, it is important for health professionals and policymakers in each country to enhance PV mechanisms that could potentially benefit regulatory decision making.

**Conclusion**
This study has summarized research trends in Nepal concerning PV and ADR. It shows that there is a need to study and evaluate ADR and PV in Nepal to improve PV practice and promote quality use of medicines. This study presents a bibliometric overview of publications on PV and ADRs in Nepal through the analysis of temporal research productivity, analysis of types of research papers, and providing a list of journals where these papers are published.

**Acknowledgements**
The author(s) would like to acknowledge João Batista Ferreira, Department of Management and Economics, Universidade Federal de Lavras (UFLA), Lavras/MG, Brazil for his contribution to the analysis of keywords.

**Author contributions**
SS and KD conceived the study. SS, KD, BKC, and SP developed the methods. SS, KD, and SP collected, checked and screened the obtained information. SS and KD analyzed the data. SS, KD, BKC, SP, and MIMI wrote the manuscript. All the authors edited and revised the manuscript, and read and approved the final version of the manuscript.

**Funding**
The authors received no financial support for the research, authorship, and/or publication of this article.

**Conflict of interest statement**
The authors declare that there is no conflict of interest.

**Ethical approval and consent to participate**
No ethical approval was needed as this was an analysis of available published research. No authors were communicated for additional information concerning their publications.

**Consent for publication**
Not applicable.
References

1. World Health Organization. *Safety of medicines: a guide to detecting and reporting adverse drug reactions: why health professionals need to take action*. Geneva: World Health Organization, 2002.

2. Davies EC, Green CF, Taylor S, *et al*. Adverse drug reactions in hospital in-patients: a prospective analysis of 3695 patient-episodes. *PLoS One* 2009; 4: e4439.

3. Lazarou J, Pomeranz BH and Corey PN. Incidence of adverse drug reactions in hospitalized patients: a meta-analysis of prospective studies. *JAMA* 1998; 279: 1200–1205.

4. Adhikary J, Basavaraj B, Adarsh E, *et al*. A study to assess knowledge, attitude and practice of adverse drug reaction reporting among physicians in a tertiary care hospital. *J Evol Med Dent Sci* 2013; 2: 1027–1035.

5. Olsson S, Pal SN, Stergachis A, *et al*. Pharmacovigilance activities in 55 low- and middle-income countries. *Drug Saf* 2010; 33: 689–703.

6. World Health Organization. *WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems*. Geneva: World Health Organization, 2004.

7. Fornsier G, Francescon S, Leone R, *et al*. An historical overview over Pharmacovigilance. *Int J Clin Pharm* 2018; 40: 744–747.

8. Uppsala Monitoring Centre. *Members of the WHO programme for international drug monitoring*, https://www.who-umc.org/global-pharmacovigilance/members/who-programme-members/.

9. Government of Nepal, Department of Drug Administration, Ministry of Health and Population. *Pharmacovigilance*, http://www.dda.gov.np/content/pharmacovigilance (2018).

10. Rosas SR, Kagan JM, Schouten JT, *et al*. Evaluating research and impact: a bibliometric analysis of research by the NIH/NIAID HIV/AIDS clinical trials networks. *PLoS One* 2011; 6: e17428.

11. Murphy LS, Kraus CK, Lotfipour S, *et al*. Measuring scholarly productivity: a primer for junior faculty. *Part III: understanding publication metrics*. *West J Emerg Med* 2018; 19: 1003–1011.

12. Huang HC, Wang CH, Chen PC, *et al*. Bibliometric analysis of medication errors and adverse drug events studies. *J Patient Saf* 2019; 15: 128–134.

13. Rodrigues SP, van Eck NJ, Waltman L, *et al*. Mapping patient safety: a large-scale literature review using bibliometric visualisation techniques. *BMJ Open* 2014; 4: e004468.

14. Palaian S, Ibrahim MI and Mishra P. Pattern and quality of scientific communications on drug safety produced by a regional pharmacovigilance center in Nepal. *Pharm Pract (Granada)* 2010; 8: 179–186.

15. Sweileh WM, Wickramage K, Pottie K, *et al*. Bibliometric analysis of global migration health research in peer-reviewed literature (2000–2016). *BMC Public Health* 2018; 18: 777.

16. Liao H, Tang M, Luo L, *et al*. A bibliometric analysis and visualization of medical big data research. *Sustainability* 2018; 10: 166.

17. Van Raan AF. The use of bibliometric analysis in research performance assessment and monitoring of interdisciplinary scientific developments. *Technology Assessment-Theory and Practice* 2003; 1: 20–29.

18. Subedi N. Systemic adverse drug reactions of antihypertensive agents. *Value Health* 2016; 19: A862.

19. Gupta S, Mishra P, Palaian S, *et al*. Probable cutaneous allergic response to subcutaneous heparin-a case report. *Acta Dermatovenerol Alp Pannonica Adriat* 2006; 15: 98.

20. Shrestha JTM, Shrestha H, Prajapati M, *et al*. Adverse effects of oral hypoglycemic agents and adherence to them among patients with type 2 diabetes mellitus in Nepal. *J Lumbini Med Col* 2017; 5: 34–40.

21. Nepali N, Alam K, Khan G, *et al*. Phenobarbitone-induced erythema multiforme-macular type in an 8-year-old child-a case report. *J Pak Assoc Dermatol* 2016; 18: 60–63.

22. Rauniar G and Panday D. Adverse drug reaction (ADR) monitoring at the eastern regional pharmacovigilance centre, Nepal. *Kathmandu Univ Med J (KUMJ)* 2017; 15: 296–300.

23. Shrestha R, Regmi B, Pokhrel D, *et al*. Prevalence and types of cutaneous drug
24. Chhetri AK, Saha A, Verma SC, et al. A study of adverse drug reactions caused by first line anti-tubercular drugs used in directly observed treatment, short course (DOTS) therapy in Western Nepal, Pokhara. *J Pak Med Assoc* 2008; 58: 531–536.

25. Sigdel M, Dhakal SR, Kandel P, et al. A study of adverse drug reactions caused by second line anti-tubercular drugs used in Nepal. *Int J Health Sci Res* 2016; 6: 201–208.

26. Neupane GP and Rai M. Adverse drug reaction profile and prescription pattern of antihypertensive drug monotherapy at tertiary care hospital Nepalgunj, Nepal. *Int J Basic Clin Pharmacol* 2017; 7: 75–79.

27. Neupane S and Basnet B. Cutaneous adverse drug reactions: a four-year study from western Nepal. *J Gandaki Med Coll-Nepal* 2017; 10: 21–26.

28. Neupane S and Sharma SR. Adverse drug reactions: a 6-month teaching hospital based study from Mid-Western Nepal. *J Clin Diagn Res* 2012; 6: 445–448.

29. Santosh K, Tragulpiankit P, Gorsanan P, et al. Strengthening the pharmacovigilance programme in Nepal. *Nepal J Epidemiol* 2013; 3: 230–235.

30. Jha N, Rathore DS, Shankar PR, et al. Strengthening adverse drug reaction reporting in Nepal. *Asian J Med Sci* 2015; 6: 9–13.

31. Angadi SS and Karn A. Ibuprofen induced Stevens-Johnson syndrome-toxic epidermal necrolysis in Nepal. *Asia Pac Allergy* 2016; 6: 70–73.

32. Poudel RR and Kafle NK. Tizanidine-induced acute severe cystitis in a female taking famotidine. *Clin Pharmacol* 2015; 7: 83.

33. Guragain S, Upadhyay N and Bhattarai BM. Adverse reactions in leprosy patients who underwent dapsone multidrug therapy: a retrospective study. *Clin Pharmacol* 2017; 9: 73.

34. Palaian S, Ibrahim MI and Mishra P. Pattern and quality of scientific communications on drug safety produced by a regional pharmacovigilance center in Nepal. *Pharm Pract (Granada)* 2010; 8: 179.

35. Palaian S, Ibrahim MI and Mishra P. Pattern of adverse drug reactions reported by the community pharmacists in Nepal. *Pharm Pract (Granada)* 2010; 8: 201.

36. Comstock GW. Comment by Professor Comstock. *Tubercle* 1991; 72: 305.

37. Jha N, Bajracharya O, Shrestha R, et al. Starting a pharmacovigilance program within a teaching hospital: challenges and experiences from Lalitpur, Nepal. *South Med Rev* 2009; 2: 7.

38. Palaian S, Mishra P, Shankar P, et al. Safety monitoring of drugs—where do we stand? *Kathmandu Univ Med J (KUMJ)* 2006; 4: 119–127.

39. Das B, Deo S, Jha N, et al. Knowledge, attitudes and practices (KAP) regarding the management of diarrhea by pharmacists and licensed drug sellers in eastern Nepal. *Southeast Asian J Trop Med Public Health* 2005; 36: 1562.

40. Das B, Rauniar G and Bhattacharya S. Medical errors challenges for the health professionals: need of Pharmacovigilance to prevent. *JNMA J Nepal Med Assoc* 2006; 45: 273–278.

41. Palaian S, Mishra P, Shankar P, et al. Contribution of the regional drug information center towards drug safety. *JNMA J Nepal Med Assoc* 2006; 45: 216–218.

42. Mallik S, Palaian S, Ojha P, et al. Pattern of adverse drug reactions due to cancer chemotherapy in a tertiary care teaching hospital in Nepal. *Pak J Pharm Sci* 2007; 20: 214–218.

43. Jha N, Bajracharya O and Namgyal T. Prevalence of adverse drug reactions with commonly prescribed drugs in different hospitals of Kathmandu valley. *Kathmandu Univ Med J (KUMJ)* 2007; 5: 504–510.

44. Alam K and Palaian S. Prevalence of adverse drug reactions with commonly prescribed drugs in different hospitals of Kathmandu valley. *Kathmandu Univ Med J (KUMJ)* 2008; 6: 148.

45. Subish P, Mishra P and Shankar P. Systemic adverse drug reactions: a preliminary report from the regional pharmacovigilance center, western Nepal. *Pak J Pharm Sci* 2008; 21: 465–467.

46. Kishore PV, Palaian S, Ojha P, et al. Pattern of adverse drug reactions experienced by tuberculosis patients in a tertiary care teaching hospital in Western Nepal. *Pak J Pharm Sci* 2008; 21: 51–56.

47. Khanal S, Gyawali S, Kanodia R, et al. Pharmacovigilance: urgent need in midwestern region of Nepal. *Kathmandu Univ Med J* 2009; 7: 470.
students in Nepal. *Am J Pharm Educ* 2009; 73: 114.

49. Khanal S, Poudel A, Sharan K, et al. Oncology pharmacy practice in a teaching hospital in Nepal. *J Oncol Pharm Pract* 2010; 16: 75–79.

50. Palaian S, Ibrahim MI, Mishra P, et al. Pharmacovigilance activities in Nepal. *Drug Saf* 2010; 33: 889.

51. Subish P, Izham M, Mishra P, et al. Education sessions for pharmacy students on pharmacovigilance: a preliminary study. *J Clin Diagn Res* 2010; 4: 2427–2432.

52. Palaian S, Ibrahim MI and Mishra P. Health professionals’ knowledge, attitude and practices towards pharmacovigilance in Nepal. *Pharm Pract (Granada)* 2011; 9: 228.

53. Jha N, Shankar P, Bajracharya O, et al. Adverse drug reaction reporting in a pharmacovigilance centre of Nepal. *Australas Med J* 2012; 5: 268.

54. Santosh K, Tragulpiankit P, Gorsanan S, et al. Attitudes among healthcare professionals to the reporting of adverse drug reactions in Nepal. *BMC Pharmacol Toxicol* 2013; 14: 16.

55. Bhuvan K, Atrasheedy AA and Ibrahim MI. Do community pharmacists in Nepal have a role in adverse drug reaction reporting systems? *Australas Med J* 2013; 6: 100.

56. Santosh KC, Tragulpiankit P, Edwards IR, et al. Knowledge about adverse drug reactions reporting among healthcare professionals in Nepal. *Int J Risk Saf Med* 2013; 25: 1–16.

57. Bhuvan KC, Atrasheedy AA and Ibrahim MI. A case report from Nepalese community pharmacy on levofloxacin induced severe abdominal pain. *Saudi Pharm J* 2013; 21: 323–325.

58. Jha N, Rathore DS, Shankar PR, et al. An educational intervention’s effect on healthcare professionals’ attitudes towards pharmacovigilance. *Australas Med J* 2014; 7: 478.

59. Jha N, Rathore DS, Shankar PR, et al. Pharmacovigilance knowledge among patients at a teaching hospital in Lalitpur district, Nepal. *J Clin Diagn Res* 2014; 8: 32.

60. Jha N, Rathore DS, Shankar PR, et al. Need for involving consumers in Nepal’s pharmacovigilance system. *Australas Med J* 2014; 7: 191.

61. Alam K, Shalaxy R and Ojha P. Reporting adverse drug reactions among hospitalized medical patients: a prospective study from tertiary care hospital in western Nepal. *Nepal J Epidemiol* 2014; 4: 330–336.

62. Rauniar G and Panday D. Adverse drug reaction (ADR) monitoring at the eastern regional pharmacovigilance centre, Nepal. *Kathmandu Univ Med J (KUMJ)* 2017; 15: 296–300.

63. Jha N, Rathore DS, Shankar PR, et al. Effect of an educational intervention on knowledge and attitude regarding pharmacovigilance and consumer pharmacovigilance among community pharmacists in Lalitpur district, Nepal. *BMC Res Notes* 2017; 10: 4.

64. Shrestha S, Shrestha S and Khanal S. Establishment of the first cancer hospital-based pharmacovigilance center in Nepal. *Res Social Adm Pharm* 2018; 14: 1088–1089.

65. Shrestha S, Shalaya R, Shrestha S, et al. Adverse drug reaction due to cancer chemotherapy and its financial burden in different hospitals of Nepal. *Int J Pharmacovigilance* 2017; 2: 1–7.

66. Shrestha S, Ghimire BR, Shalaya S, et al. Macula erythematous rash due to temozolomide involving head and neck region only. *Int J Pharmacovigilance* 2018; 3: 1–2.

67. Shankar PR, Subish P, Mishra P, et al. Teaching pharmacovigilance to medical students and doctors. *Indian J Pharmacol* 2006; 38: 316.

68. Mishra P, Subish P, Gupta S, et al. Pattern and economic impact of cutaneous adverse drug reactions: initial experiences from the regional pharmacovigilance center, Western Nepal. *Int J Risk Saf Med* 2006; 18: 163–171.

69. Shankar PR. Pharmacovigilance in Nepal: whose baby is it anyway? *Australas Med J* 2013; 6: 132.

70. Dubey A, Prabhu S, Shankar PR, et al. Cutaneous adverse drug reactions to modern medicines and initial experiences from a spontaneous adverse drug reaction reporting program in a tertiary care teaching hospital of Western Nepal. *J Pak Assoc Dermatol* 2016; 15: 222–226.

71. Thapaliya K, Shrestha A, Prajapati A, et al. Study of pattern of adverse drug reaction due to cancer chemotherapy and their management in hospitalized patient in BP Koirala memorial cancer hospital. *J Chitwan Med Coll* 2014; 4: 24–28.

72. Palaian S, Ibrahim M, Izham M, et al. Development of pharmacovigilance training module for community pharmacists in Nepal: a focus group study. *J Pharm Pract* 2016; 7: 130.
73. Prabhu MM, Prabhu S, Mishra P, et al. Digital gangrene due to dopamine infusion-a case report. J Pak Assoc Dermatol 2016; 15: 197–199.

74. Paudel R, Palaian S, Kishore PV, et al. Peripheral edema due to S-amldipine–a report of three cases. J Clin Diagn Res 2007; 1: 533–536.

75. Paudel R, Kishore PV, Mishra P, et al. Clonidine induced acute urticarial rashes-a case report and review of literature. J Pharm Pract Res 2006; 36: 218.

76. Prabhu MM, Prabhu SM, Mishra P, et al. Local eczematous allergic reaction to the menadione (vitamin k3) injection. Timisaura Med J. 2005; 55.

77. Dwari B, Bajaracharya S, Gupta S, et al. 67. Fixed drug eruption due to co-trimoxazole: a case report. J Inst Med 2007; 28.

78. Nepali N, Kalam A, Subish P, et al. Hemoglobinuria due to ofloxacin in a 9 year old child-a case report. Pharmacology online. 2007; 1: 1–5.

79. Dwari BC, Bajaracharya S, Mishra P, et al. Morbilliform rashes due to erythromycin in a patient with herpes zoster infection. J Pak Assoc Dermatol 2016; 17: 125–129.

80. Palaian S, Kishore P and Mishra P. Co-amoxiclav: a common antibiotic with an uncommon presentation of anaphylaxis-a rare case report. Pharmacology online 2007; 1: 6–10.

81. Dwari BC, Palaian S, Arulamudhan R, et al. Stevens-Johnson syndrome due to sulfasalazine. Pharmacology online 2007; 1: 17–22.

82. Shakya R, Rao BS and Shrestha B. Incidence of hepatotoxicity due to antitubercular medicines and assessment of risk factors. Ann Pharmacother 2004; 38: 1074–1079.

83. Palaian S, Mishra P, Bista D, et al. 57. Safety profile of herbal drugs: urgent need for monitoring. J Inst Med 2007; 28.

84. Shankar P and Subish P. Designing a spontaneous adverse drug reaction reporting form: an exercise for medical students. Int J Risk Saf Med 2006; 18: 115–119.

85. Dubey A, Prabhu S, Shankar PR, et al. Dermatological adverse drug reactions due to systemic medications–a review of literature. J Pakistan Assoc Dermatologists 2006; 16: 28–38.

86. Shrestha R, Shakya S, Bista D, et al. Case studies of hospitalized patients due to drug related complications. Kathmandu Univ J Sci Eng Technol 2006; 2: 1–9.

87. Shankar R. Increasing ADR reporting in Nepal. Nepal J Epidemiol 2013; 3: 252.

88. Adhikari SR, Pandey AR, Ghimire M, et al. Universal access to essential medicines: an evaluation of Nepal’s free health care scheme. J Nepal Health Res Counc 2018; 16: 36–42.

89. Gurung S and Pandey RA. Perception of side effects of chemotherapy among cancer patients in BP Koirala Memorial Cancer Hospital Bharatpur, Nepal. J Coll Med Sci Nepal 2015; 11: 14–19.

90. Katuwal N, Khatri D, Shrestha DB, et al. A study on mefloquine-associated neuropsychiatric manifestations among Nepalese soldiers posted for United Nations peace mission. J Kathmandu Med Coll 2018; 7: 97–101.

91. Giri A, Srivastav V, Suwal A, et al. A study of complications following self-administration with medical abortion pills. Nepal J Obstet Gynecol 2015; 10: 20–24.

92. Kanchan K and Thapa RK. Comparison of azithromycin and doxycycline in treatment of acute uncomplicated pelvic inflammatory disease. Med J Shree Birendra Hosp 2017; 16: 24–29.

93. Paudel S, Chetty MS, Laudari S, et al. Adverse drug reactions of antihypertensive agents at tertiary care hospital in central Nepal. J Coll Med Sci Nepal 2017; 13: 284–289.

94. Bista D, Shrestha BR, Rai P, et al. Pattern of adverse drug reactions reported to the regional Pharmacovigilance center at Nepal Medical College and Teaching Hospital, Kathmandu. J Nepal Pharmaceutical Assoc 2012; 26: 54–61.

95. Subish P, Izham MM, Mishra P, et al. Safety alerts on Rosiglitazone. J Inst Med 2009: 32–33.

96. Kokkada S, Barthakur R, Natarajan M, et al. Ocular side effects of antitubercular drugs-a focus on prevention, early detection and management. Kathmandu Unives Med J (KUMJ) 2005; 3: 438–441.

97. Mishra P and Palaian S. Withdrawal of rofecoxib - a wake up call for drug safety. Kathmandu Univ Med J (KUMJ) 2004; 2: 360–360.

98. Prabhu MM, Prabhu S, Mishra P, et al. Cellulitis-like fixed drug eruption attributed to paracetamol (acetaminophen). Dermatol Online J 2005; 11: 24.

99. Shrestha D, Gurung D and Kumar A. Severe cutaneous adverse reactions: an evidence based approach. J Inst Med 2007; 27.

100. Paraju S, Paudel U, Poudyal AK, et al. A clinical study of steroid induced dermatoses.
101. Shah B, Taparia R and Mishra A. Olanzapine-induced convulsive status epilepticus: a case report from Eastern Nepal. J Psych Assoc Nepal 2018; 7: 68–70.

102. Hirachan R, Gopi P, Bibek R, et al. Anaphylaxis to ceftriaxone—evaluation of two cases. J Gandaki Med Coll-Nepal 2018; 11: 82–84.

103. Shah N and Paudel R. Pentazocine induced ulcers: a presentation of drug abuse. J BP Koirala Inst Health Sci 2018; 1: 75–77.

104. Mishra DR, Dahal K and Gupta P. Pantoprazole induced thrombocytopenia: a case report. J BP Koirala Inst Health Sci 2018; 1: 105–107.

105. Sharma SK, Dubey L, Guruprasad S, et al. Contrast induced nephropathy-cardiologist perspective. Nepal Heart J 2013; 10: 30–37.

106. Jha N, Rathore DS, Shankar PR, et al. Knowledge, attitude and practice regarding pharmacovigilance and consumer pharmacovigilance among consumers at Lalitpur district, Nepal. J Nepal Health Res Coun 2017; 15: 31–37.

107. Bhatt CP and KC B. Side effects associated with drugs used in treatment of multi drug resistant tuberculosis and treatment related factors of multi drug resistant tuberculosis patients In Kathmandu valley. SAARC J Tuberculosis, Lung Dis HIV/AIDS 2017; 14: 1–6.

108. Paudel U, Parajuli S and Pokhrel D. Patterns and outcomes of cutaneous adverse drug reactions in a hospital based study. Nepal J Dermatol Venereol Leprol 2017; 15: 44–48.

109. Aryan GP, Mishra A. The prevalence of adverse drug reactions ADR in patients at a tertiary care hospital in Nepal a pilot study. J Psych Assoc Nepal 2014; 3: 41–42.

110. Gurung R, Subedi A and Bhattarai B. Valproic acid induced acute necrotizing pancreatitis. J Soc Anesthesiol Nepal 2014; 1: 86–88.

111. Roy R, Bhattarai A, Shrestha P, et al. Dapsone induced exfoliative dermatitis: a case report. J Coll Med Sci Nepal 2010; 6: 64–66.

112. Pradhan M and Jha BD. A randomized comparative study of preloading with Ringers lactate and intravenous Ephedrine for the prevention of hypotension due to propofol during induction of general anesthesia. J Soc Anesthesiol Nepal 2016; 3: 22–27.

113. Upreti A, Joshi D, Rijal B, et al. Adverse drug reaction following mass drug administration during the program to eliminate lymphatic filariasis in banke district, Nepal. Int J Pharm 2014; 4: 62–67.

114. Shrestha D, Dhakal A and Singh K. Erythromycin induced carbamazepine toxicity—a preventable drug interaction. J Chitrwan Med Coll 2013; 3: 52–53.

115. Sigdel M, Dhakal SR, Kandel P, et al. A study of adverse drug reactions caused by second line anti-tubercular drugs used in Nepal. Int J Health Sci Res 2016; 6: 201–208.

116. Jha KK, Chaudhary DP, Rijal T, et al. Delayed Stevens–Johnson syndrome secondary to the use of lamotrigine in bipolar mood disorder. Indian J Psychol Med 2017; 39: 209.

117. Chandra A, Rajbhandari R, Acharya S, et al. Vaccine induced acute transverse myelitis: a case report. Nepal J Neurosci 2014; 3: 41–42.

118. Gurung R, Subedi A and Bhattarai B. Valproic acid induced acute necrotizing pancreatitis. J Soc Anesthesiol Nepal 2014; 1: 86–88.

119. Roy R, Bhattarai A, Shrestha P, et al. Dapsone induced exfoliative dermatitis: a case report. J Coll Med Sci Nepal 2010; 6: 64–66.

120. Pradhan M and Jha BD. A randomized comparative study of preloading with Ringers lactate and intravenous Ephedrine for the prevention of hypotension due to propofol during induction of general anesthesia. J Soc Anesthesiol Nepal 2016; 3: 22–27.

121. Karunaratne D and Khatri R. Nimesulide induced Stevens-Johnson syndrome. Nepal J Dermatol Venereol Leprol 2010; 9: 25–27.

122. Maskey R, Sharma S and Poudel K. Metronidazole induced peripheral neuropathy. Health Renaiss 2011; 9: 119–121.

123. Roka Y, Roka N and Adhikari H. Lamotrigine induced severe cutaneous reaction. J Nepal Paediatr Soc 2012; 32: 172–174.

124. Roka Y, Roka N and Adhikari H. Lamotrigine induced severe cutaneous reaction. J Nepal Paediatr Soc 2012; 32: 172–174.

125. Parajuli S, Chaudhary D, Pandey S, et al. Leflunomide induced DRESS syndrome: a case report. Nepal J Dermatol Venereol Leprol 2012; 10: 46–48.

126. Khadka J, Malla P, Jha S, et al. The study of drug induced hepatotoxicity in ATT patients attending in national tuberculosis center in...
Bhaktapur. *SAARC J Tuberculosis, Lung Dis HIV/AIDS* 2009; 6: 17–21.

127. Poudel A, Palaian S, Shankar PR, *et al.* Irrational fixed dose combinations in Nepal: need for intervention. *Kathmandu Univ Med J (KUMJ)* 2008; 6: 399–405.

128. Palaian S and Mishra P. Role of drug and therapeutics committee towards drug safety—experiences from western Nepal. *Kathmandu Univ Med J (KUMJ)* 2005; 3: 79.

129. Mishra P, Alurkar V and Subish P. Functions of a drug and therapeutics committee in Nepal. *J Pharm Pract Res* 2006; 36: 164.

130. Shankar PR, Mishra P, Subish P, *et al.* The drug information center at the Manipal teaching hospital—going beyond drug information. *Drug Inf J* 2007; 41: 761–768.

131. Gupta S, Alam K, Palaian S, *et al.* Metronidazole induced bullous fixed drug eruptions: a case report and a review of literature. *Int J Dermatol* 2006; 5: 1–6.

132. Pandey B, Shrestha K, Lewis J, *et al.* Mortality due to dapsone hypersensitivity syndrome complicating multi-drug therapy for leprosy in Nepal. *Trop Doct* 2007; 37: 162–163.

133. Shakya R, Rao B and Shrestha B. Management of antitubercular drugs-induced hepatotoxicity and therapy reintroduction strategy in a TB clinic of Nepal. *Kathmandu Univ Med J (KUMJ)* 2005; 3: 9–45.

134. Chhetri AK, Palaian S, Mishra P, *et al.* Introduction to DOTS strategy and the safety profile of first line antitubercular drugs— a review of literature. *J Inst Med Nepal* 2006; 28: 63.