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Research Article

A PHARMACOEPIDEMIOLOGICAL STUDY OF NEW DRUG APPROVAL PATTERN OF JAPAN

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ABSTRACT

Objectives: The objective of the study was to study the drug development and drug approval pattern of a developed Asian country: Japan.

Methods: Data available on official website of Japan government health authority was compiled for the duration of January 2017–December 2021. The new approved drugs were classified based on different parameters such as active ingredient, drug approval date, review category, new approval or partial change, Indication of drugs, and WHO anatomic thoracic classification. The descriptive analysis of data was done using LibreOffice Calc.

Results: Out of 545 drugs approved, 46% were anti-neoplastic and immunomodulating agent, 10% were anti-infective and 9% were Nervous system category. Furthermore, among all approved drugs, 51.38% were new approved drugs while 48.62% of drugs were approved with partial change in dosage, route, or indications.

Conclusion: This study showed new drug development and approval was done significantly for anti-cancer agents and agents for non-communicable diseases.

Keywords: New drug development, New drug approval pattern, Japan.

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INTRODUCTION

New drug development is very important for scientific progress in any country. Every country has their needs for new drug development that should be fulfilled by pharma industry. According to New Drug and Clinical Trial Rules 2019, a new drug is defined as any active pharmaceutical ingredient or phytopharmaceutical drug which is not approved in that country or any approved drug having modified or new claim for indication, route of administration, dosage, and dosage form. As well as new drug is any new fixed-dose combination of two approved drug or modified or new claim for indication, route of administration, dosage, and dosage form. It also includes a modified or sustained release form of a drug or novel drug delivery system of any approved drug. As well as a vaccine, r-DNA-derived product, living modified organism, monoclonal antibody, stem cell-derived product, gene therapeutic product, or xenografts, intended to be used as drug [1].

The Japan has Clinical Trial Guidance material that provides guidance to manufacturers, importers, and suppliers on the regulatory requirements relating to the import and supply of clinical research materials [2]. As a doctor, it is important to know the new drug approval pattern of the country so they can prescribe the new medicine to the patient. As per a study, the drug approval process in India has more lag time as compared to developed countries such as UK and US which could lead to delay of a few years for the new drug to come out in the market [3]. For a pharma industry, it is important to know the new drug approval pattern of that country to remain relevant with the current trend in the pharmaceutical market. Hence, the study of drug approval pattern is important for various stakeholders of healthcare delivery. Each country has the regulatory authority to check the authentic information regarding new drug approval and such information is available in the public domain, for example, India it is Central Drug Standard Control Organization [4]. For US, authentic information is available on Center for Drug Evaluation and Research (CDER) website, established in 1987 under the US FDA [5]. Similarly the authentic data for European Union is available on the European medical agency (EMA) website [6]. Different studies conducted all over the world have shown that there is a change in the pattern of new drug approval with more number of anticancer and biologics being approved [7]. Such studies have mainly been done in US FDA using CDER data and European countries using EMA website data.

However, a similar study is lacking in Japan which formed the basis for this study. With Japan becoming one of the fast-growing countries in pharmaceutical engineering and export output of pharmaceutical products, it becomes imperative that a database is generated for its new drug approval pattern.

METHODS

This was a pharmacoepidemiological retrospective observational type of study in which the drug approval pattern of new drugs in Japan was studied. Data available on the official website of Japan government health authority were searched [8]. The data were compiled for the duration of January 2017–December 2021. Data on the website were available in form of monthly approval which was then entered to LibreOffice Calc spreadsheet. The new approved drugs were classified based on different parameters such as active ingredient, drug approval date, review category, new approval or partial change, Indication of drugs, and WHO anatomic thoracic classification (ATC). In WHO ATC classification, the active ingredients were classified in 14 main anatomical or pharmacological groups. Active ingredient is also classified according to hierarchy in five different levels – from which we have used level one classification with 14 main groups in this study. The descriptive analysis of data was done using LibreOffice Calc. Ethical permission was not sought as the new drug approval chemical and biological entity data is freely available in the public domain of the Government website.

RESULTS

There was a total of 545 new drugs which were approved in Japan during the period 2017–2021, with an average of 108 new drugs approved annually in the last 5 years. On the classification of all the drugs according to WHO ATC classification, it was found that the maximum number of new drugs approvals 250 (46%) were from antineoplastic and immune-modulating agent category which was followed by 56 (10%) new drug approvals in Antiinfective category and 46 (9%) new drug approvals in nervous system category (Table 1).

Out of 545 drugs approved in Japan, 280 drugs were new approved drug, while 265 drugs were partial changes such as new dosage form, new route of drug administration, and new indication. Out of 545 drugs approved 127 (23%) were orphan drug and eight drugs got emergency approval for COVID-19 infection in 2020–2021 drugs such as satrovimab, remdesivir, tozinameran, and COVID-19 vaccine. In our study, lymphoma (23) and lung cancer (23) were the most common cancer, followed by leukemia (13) and breast cancer (13) for which drugs were approved.

Drug approved for lymphoma were Nivolumab, Tirabrutinib, Rituximab, Acalabrutinib, Brigatinib, Denileukin diftitox, Polatuzumab, Bendamustine, Brentuximab Lenalidomide, Alectinib, Tirabrutinib, Obinutuzumab, Mogamulizumab, Pralatrexate, Romidepsin, Pembrolizumab, and Bortezomib. While drugs approved for lung cancer were Selpercatinib, Capmatinib, Durvalumab, Nivolumab, Ipilimumab, Atezolizumab, Necitumumab, Gemcitabine, Atezolizumab, Entrectinib, Tepotinib, Osimertinib, Lorlatinib, Dacomitinib, Ceritinib, Dabrafenib, and Trametinib.

Other common diseases in the present study were rheumatoid arthritis, multiple myeloma, psoriasis, prostate cancer, melanoma, arthritis, and hepatocellular cancer for which drugs were approved. In Japan, the drugs were categorized in various review categories and in our study oncology drugs were most common 167 (31%) (Table 2).

Table 1: Numbers of drug approved among different class of WHO ATC classification

ATC Class	Drug no. (%)
A	39 (7)
B	35 (6
C	23 (4)
D	6 (1)
G	8 (2)
H	18 (3)
J	56 (10)
L	250 (46)
M	11 (2)
N	46 (9)
R	17 (3)
S	10 (2)
V	16 (3)
None	10 (2)
Total	545

DISCUSSION

This study was an observational retrospective study of drug approval pattern from 2017 to 2021 of the developed country Japan. In this, 108 new drugs approved annually which is comparable with other developed country like Singapore having 86.3 but CDER USA approved 51 new drug annually [9,10]. Hence, South East Asian countries are far ahead in new drug approval to other developed country. Recently, COVID-19 had impacted heavily so drug approval was reduced during that time. In that time, emergency use authorization was given to COVID-19 medicines and COVID-19 vaccine.

In this study, nearly half of the drug approval is for Antineoplastic and immunomodulating agents. Similar results were found in other studies [11-15]. Reason for maximum approval for anti-cancer drug was the increasing prevalence of non-communicable diseases, especially various cancers. That is due to unhealthy lifestyle, diet, tobacco, alcohol consumption, environmental pollution, and pesticides. Lymphoma and lung cancer were the most common cancer for which the number of anti-cancer were approved during this period.

In the present study, 23% approval for orphan drugs which shows the importance given by the government for orphan drug development by various schemes and incentives. Similar measures were also taken by other developed countries such as US and UK [10].

This study had generated preliminary data which will be helpful to pharmaceutical company as well as the government for future drug development. In this study, retrospective analysis of past 5 years drug approval data was done and future study can be planned with larger time frame.

Table 2: Numbers of drugs approved according to various review category

Review category	Drug class in review category	Number of drugs
1	Gastrointestinal drugs, dermatologic drugs, immunosuppressive drugs, and others (not classified as other categories)	57
2	Cardiovascular drugs, anti parkinsonian drugs, anti-Alzheimer's drugs	40
3–1	Central/peripheral nervous system drugs (excluding anesthetic drugs)	47
3–2	Anesthetic drugs, sensory organ drugs (excluding drugs for inflammatory diseases), narcotics	17
4	Antibacterial drugs, antiviral drugs (excluding AIDS drugs), antifungal drugs, antiprotozoal drugs, and anthelmintic drugs	35
5	Reproductive system drugs, drugs for urogenital system, combination drugs	14
6–1	Respiratory tract drugs, anti-allergy drugs (excluding dermatologic drugs), sensory organ drugs (drugs for inflammatory diseases)	68
6–2	Hormone drugs, drugs for metabolic disorders (including diabetes mellitus, osteoporosis, gout, and in born errors of metabolism)	35
AIDS drugs	Anti-HIV drugs	9
Oncology drugs	Antineoplastic drugs	167
Blood products	Blood products	13
Vaccines	Vaccines (only those to be used for prevention of infection), antitoxic serum, etc.	12
Radio-pharmaceuticals	Contrast agents, reagents for function tests	9
Bio-CMC	Quality of biologics, biosimilars	22

AIDS: Acquired immunodeficiency syndrome, HIV: Human immunodeficiency virus

CONCLUSION

This observational study found that South East Asian countries are ahead of western country in new drug approvals. This study showed significant new drug development and approval was done for anti-cancer drug during 2017–2021.

AUTHORS' CONTRIBUTION

All authors contributed equally in data collection, analysis, and manuscript writing.

CONFLICTS OF INTERESTS

Nil.

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REFERENCES

1. New Drugs and Clinical Trials Rules 2019 G.S.R. 227(E) CDSCO; 2019. Available from: https://cdsco.gov.in/opencms/export/sites/cdsco_web/pdfdocumentsnewdrugs_ctrules_2019.pdf [Last accessed on 2022 May 28].
2. Clinical Trials Guidance: Clinical Research Materials. GN-IOCTB-03 Rev. No. 002. Health Sciences Authority-health Products Regulation Group, Singapore. Available from: https://www.hsa.gov.sg/docs/default-source/hprg-io-ctb/hsa_gn-ioctb-03_crm_1mar2021.pdf [Last accessed on 2022 May 28].
3. Kataria BC, Panchal PJ, Panchasara AK, Pandya AS, Parmar MR. Comparison of new drug approval by regulatory agencies of US, EU and India. Int J Basic Clin Pharmacol. 2016;5:112-5.
4. Central Drug Standard Control Organisation. Directorate General of Health Services. Ministry of Health and Family Welfare: Government of India. Available from: https://cdsco.gov.in/opencms/opencms/en/home [Last accessed on 2022 May 28].
5. Center for Drug Evaluation and Research (CDER): US Food and Drug Administration. Available from: https://www.fda.gov/about-fda/fdaorganization/center-drug-evaluation-and-research-cder [Last accessed on 2022 May 28].
6. European Medicines Agency. Science Medicines Health. Available from: https://www.ema.europa.eu/en [Last accessed on 2022 May 28].
7. Batta A, Kalra BS, Khirasaria R. Trends in FDA drug approvals over last 2 decades: An observational study. J Family Med Prim Care. 2020;9:105-14.
8. Health Science Authority. Singapore. Available from: https://www.hsa.gov.sg/announcements?contenttype=New%20Drug%20Approvals [Last accessed on 2022 May 28].
9. Chavda N, Patel N, Dhanani JV, Solanky P. A study of new drug approval pattern of a Southeast Asian developed country from 2017 to 2021. Natl J Physiol Pharm Pharmacol. 2023;13:267-73. doi: 10.5455/njppp.2023.13.06289202220062022
10. Mullard A. FDA approvals. Nat Rev Drug Discov. 2022;21:83-8.
11. Kataria BC, Panchasara AK, Pandya AS, Panchal PJ, Parmar MR. Contemplation on new drug approvals by U.S. FDA, 2011-2015. Int J Basic Clin Pharmacol. 2016;5:55-9.
12. Mullard A. 2016 FDA drug approvals. Nat Rev Drug Discov. 2017;16:73-6.
13. Phillips AT, Desai NR, Krumholz HM, Zou CX, Miller JE, Ross JS. Association of the FDA amendment act with trial registration, publication, and outcome reporting. Trials. 2017;18:333.
14. Miller JE, Wilenzick M, Ritcey N, Ross JS, Mello MM. Measuring clinical trial transparency: An empirical analysis of newly approved drugs and large pharmaceutical companies. BMJ Open. 2017;7:e017917.
15. Charan J, Dhanani JV, Doshi MS, Reljic T, Tsalatsanis A, Kumar A. Drug approval in India does not match the disease burden: A cross-sectional study. J Pharmacol Pharmacother. 2018;9:6-10.