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Unraveling the Enigma: Understanding Adverse Drug Reactions and its Impact in Medical Care

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Abstract:

Adverse drug reactions, also known as medication-related adverse events, are harmful occurrences caused on by medication. ADRs may increase the pressure on the healthcare system and have a significant negative impact on patients' quality of life. With the increasing complexity of medications used to treat a wide range of diseases in an aging society, adverse drug reactions (ADRs) are one of the leading causes of morbidity and mortality on a global scale and will remain a major public health concern. ADRs are largely determined by a variety of factors, some of which are social, pharmacological, or patient-related. For example, age plays a significant role in the incidence of adverse drug reactions (ADRs); patients in the highest age groups are more susceptible to these reactions than those in lower age groups. The impact of specific factors on adverse drug reaction (ADR) occurrence, the pharmacovigilance process, and reporting were covered in this study. Medical literature has extensive documentation of these factors' impacted on adverse drug reactions. During medical evaluation, medical professionals can select the most effective medication regimen by taking these factors into account.

Key Words: ADR; idiosyncratic; augmented; pharmacovigilance; pharmacokinetic; side effect.

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INTRODUCTION

Adverse drug reactions (ADRs) or medication-related adverse events are harmful occurrences caused on by medication. The World Health Organization (WHO) defines adverse drug reactions (ADRs) as "a response to a medication that is noxious and unintended used in human to treat." [1]. ADRs may arise from an avoidable medication error, an unanticipated error such as an allergic reaction, or a side-effect resulting from the administration of medication [2]. While the terms "adverse effect" and "adverse reaction" are commonly used interchangeably, it's important to realize that an adverse effect is experienced from the viewpoint of the medication, while an adverse reaction is experienced from the viewpoint of the patient and is usually referred to as a side effect [3]. The response could be an unexpected or previously unreported side effect of the medication. ADRs fall into two categories: idiosyncratic (type B) or pharmacological (type A), which are predictable and dose-dependent (i.e. unexpected and unrelated to the medication's mechanism of action) [4]. ADRs can range in severity from minor discomfort to serious harm. A serious adverse event (SAE) can be fatal, life-threatening, permanently or significantly incapacitating, require hospitalization or prolong it, cause a congenital anomaly, or require intervention to prevent long-term impact or damage [5] The quality of life of patients may be significantly negatively impacted by ADRs and place additional strain on the healthcare system. With the increasing complexity of medications used to treat a wide range of diseases in an aging society, adverse drug reactions (ADRs) are a significant public health concern that continue to be listed among the world's leading causes of morbidity and mortality [6].

ADRs continue to be a serious issue for patients, particularly the elderly, who take numerous medications. According to a study, medication discrepancies occurred in up to 75% of all aged care residents after moving from a hospital to a primary care setting [7]. Prescription errors in general practice are linked to the majority of adverse medication events [8]. Computerized prescribing systems have been implemented as a result of technology integration in the healthcare system. Due to this, there is a wide range of prescription mistake in rates, which may cause minor or serious adverse drug events [9, 10]. Adverse outcomes can also result from patients' and children's inappropriate use of rare drugs. Off-label prescribing is the practice of writing prescriptions for drugs for uses that have not been authorized by agencies like the Food and FDA in the United States or the Therapeutic Goods Administration in Australia. Medication or dose errors may happen in these circumstances since there is a lack of evidence to support their usage in authorized conditions [11 – 13].

Any place that provides healthcare has the potential to experience ADRs. Hospital treatment carries greater risks, which is why hospitals provide the majority of the evidence available today [14]. Numerous similar incidents take place in other healthcare environments, including patient homes, community clinics, pharmacies, nursing homes, and consultation rooms [15]. While drug delivery technologies have completely changed the pharmaceutical industry, drug safety evaluation is still lagging behind and dependent on technology that have been existing for several decades [16, 17]. The majority of ADRs are attributed to flaws in the system's design, operation and organization rather than specific practitioners or products, according to current conceptual thinking on patient safety.

This article seeks to give readers an overview of adverse drug reactions (ADRs), including their definition, types, and pharmacovigilance reporting procedures. In order to develop interventions to lower ADR in primary care today, researchers, healthcare professionals, and policy makers will find this study to be beneficial.

METHOD

Data have been collected from different reputed international journals and literature site including EMBASE, PUBMED.

DISCUSSION

This article provide academician with an overview of adverse drug reactions (ADRs), covering their types, definition, and reporting guidelines for pharmacovigilance. This work will help researchers, medical professionals, and policy makers create interventions to reduce adverse drug reactions in primary care today and all the findings are discussed throughout the study step by step.

TYPES

Five categories are used to group different sorts of ADRs (Table – 1). Allergy reactions have been studied after adverse drug-related events in the majority of research. Idiosyncratic reactions were also the subject of several investigations [18 – 20]. The body systems most frequently associated with reported adverse drug reactions (ADRs) were the cardiovascular, gastrointestinal, and central neurological systems [21, 22].

Table 1: Types of adverse drug reactions (ADRs) [23]

Type	**Description**
Type A (Augmented)	When a drug is administered at the recommended therapeutic dose, (augmented) reactions arise from an exaggeration of the drug's typical pharmacological actions and are typically dose-dependent. Examples include bleeding from warfarin or respiratory depression from opioids. Type A reactions can also include side effects unrelated to the medication's intended pharmacological action, such as dry mouth caused by tricyclic antidepressants.
Type B (Bizarre)	Events that are unanticipated resulting from the drug's recognized pharmacological effects are referred to as (bizarre) reactions. Since they are less frequent, they might not be identified initially until a medication has been approved for widespread usage. Examples include penicillin-induced anaphylaxis and antibiotic-induced skin rashes.
Type C (Chronic)	Reactions last for a considerable amount of time. Osteonecrosis of the jaw with bisphosphonates is one instance.
Type D (Delayed)	Reactions that are (delayed) take time to manifest after taking medication. These might be harder to spot because of when they occur. Leucopoenia is one such condition that can develop up to six weeks following a lomustine dose.
Type E (End-of-use)	Reactions related to stopping a medication are known as "end-of-use" reactions. Sleeplessness, anxiety, and changes in perception that occur after stopping benzodiazepines are a few examples. There

	have also been other suggested classification systems.

Pharmacovigilance & reporting

Compared to the number of patients who might use a medication once it is licensed, a medication is only exposed to a small number of patients during clinical trials and for a brief length of time. An adverse reaction needs to occur once in every 10,000 times to be identified with 95% certainty, and at least 30,000 people need to take a medicine [24]. This is why it's critical to monitor medications for the duration of their commercial life. Pharmacovigilance have meaning and relation to this [23]. Since these can be used as a tool to help prescribers and users receive the necessary guidance and/or regulatory action, post-marketing surveillance is considered necessary to detect drug safety issues not detected by pre-marketing testing.

The public and medical professionals can report adverse drug reactions (ADRs) in a number of ways, including by email, postal mail, and most frequently, yellow card. The reported ADRs are added to a database so that signal detection can use them. An acknowledgement with the report's unique identification number will then be sent to the individual who reported the ADR. Afterwards, a statistical analysis is performed on each drug reaction combination in the database, and a "disproportionately score" is assigned. This score is intended to identify drug-reaction combinations that, when compared to the background of other drug-reaction combinations in the database, have been reported unusually frequently [23]. A panel of scientists, doctors, and pharmacists evaluates these scores to ascertain whether the "signal" is likely to be a legitimate medical issue. The selection criteria for signals undergoing additional monitoring, such as drugs classified as black triangles, differ from those used for signals undergoing further evaluation with established medications.

To quickly identify any unfavorable side effect connected to a medication, a signal is evaluated in accordance with a set of criteria. Additionally, a variation in the ADRs' frequency previously linked to the medication is noted. There are additional risk factors that have been identified that could have contributed to the reaction, including age, underlying disease, and genetic susceptibility [23].

Table 2: Key information to report. [25]

Variable	**Description**
Suspect drug (s)	Provide details regarding the dosage plan, daily amount, frequency, mode of administration, and dates of administration (if the medication is a vaccine, specify the brand and batch number).
Suspect reaction (s)	When the response happened, how severe it was, if it was treated, and how it turned out.
Patient details	Information that can help identify the patient in any future correspondence: the patient's initials, weight, sex, age at the time of the reaction, and a local identification number (hospital or practice reference number).
Reporter details	Name and complete address of the reporter so that MHRA can confirm receipt of the report and, if needed, follow up for more details.
Additional information	Additional drugs, including over-the-counter and herbal therapies, taken in the three months before to the reaction; information about starting up the suspected medication or medications again; important test findings; pertinent medical history, including details on allergies; List all additional medications taken during pregnancy together with the last menstrual cycle date in case of congenital problems.

Factors related to ADR

The majority of adverse drug reactions (ADRs) are brought on by the intended pharmacologic effects becoming extended, which is often brought on by the wide variations in patient pharmacokinetic and pharmacodynamic results. The etiology of ADRs involves genetic, immunological, and pharmacological factors. Drug interactions, pharmacokinetic or pharmacodynamic abnormalities, dosage, and drug formulation are among the factors that increase the risk of

pharmacological adverse drug reactions. It is now known that many unusual drug reactions involve the metabolic conversion of drugs to metabolites [26]. Increased amounts of reactive drug metabolites, their poor detoxification, or weakened cellular defenses against reactive drug products seem to be one of the main launching factors [27]. The immune system and genetics may have an impact on how the body responds to medications. Ethnic differences are a significant factor in the development of ADRs [28 -30].

Medication administration (dosage, mode of administration, and number of concurrent medicines) and patient characteristics (gender, age, weight, creatinine clearance, and number of comorbidities) should be closely monitored. ADRs may occur more frequently in situations where certain age, gender, drug combinations, health conditions, allergies, past history of ADRs, large dosages, and a host of other variables may occur.

Drug manufacturing, supply, prescription, administration, and ingestion mistakes can all result in adverse drug reactions (ADRs). In the Harvard medical practice study, 18% of the drugs linked to adverse drug reactions (ADRs) were found to be the result of negligence, which is defined as failing to provide the minimum level of care that a doctor who is qualified to treat the patient would reasonably be expected to provide [31]. Smoking habit, alcohol drinking, body weight, eating habit and lifestyle are some sociological factors related to ADR [43]. ADR risk is increased by taking multiple medications, by both prescription and over-the-counter. When more drugs are taken, there is a corresponding increase in both the quantity and severity of adverse drug reactions. ADRs can occasionally be caused by interactions between drugs and foods or by drugs combined with other drugs. A patient's concurrent illness may also affect how susceptible they are to ADRs. As an example, consider the rise in idiosyncratic toxicity associated with anti-infective medications like trimethoprim sulfamethoxazole. In patients with renal failure, the drug elimination rate decreased. This raises the systemic dose amount, which causes an increase in adverse drug reactions.

ADR reported by previous study:

The majority of authors concluded that the primary causes of ADRs were patient characteristics, such as advanced age, enzyme, habit, limited patient education, and patient comorbidities [32 – 40]. Drug-specific factors, including drug administration, problems in distribution, drug interactions, and look-alike drugs, were also addressed in several investigations [41 – 43]. One study listed iatrogenic reasons in addition to other causes [44]. In one investigation, health environment were identified as the source of adverse drug reactions (ADRs) [45].

CONCLUSION

ADRs continue to be a major contributor to hospital admissions and a considerable number of fatalities. By considering these factors, medical professionals can choose the most effective medication regimen during medical evaluation. ADR formation is influenced by a number of elements to varying degrees; some of these factors have a direct impact on ADRs, while others have a more subtle effect. Giving these variables careful consideration will prevent or lessen the incidence of adverse drug reactions, if medical professionals had taken the time to identify these issues. Pharmacists must make use of the following resources: reconciliation, counseling, and health education.

Conflict of interest: None declared.

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