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Original Research Paper

Geriatrics

PRINCIPLES OF GERIATRIC PHARMACOLOGY.

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KEYWORDS :

INTRODUCTION:

Geriatric Medicine is a branch of medicine that aims on providing health and a better life through prevention and treatment of diseases and disabilities in elderly people. This mainly includes disease and problems that develop with time and age (for example: HTN, T2DM, Osteoarthritis, CKD, CLD, COPD, Osteoporosis, Alzheimer's or Parkinson's Disease, etc.) [1]. It is necessary to have sound knowledge about the physiological changes and social issues while prescribing drugs for the elderly people. Though the drug induced alteration of behaviour is not considered in this scenario [2]. The treatment of older adults varies widely from the treatment of the younger generation as it may include challenges like vague presentation of symptoms, attribution in cases in case of patients with multiple co-morbidities [1], altered rate of the pharmacodynamics due to increased age, poly-pharmacy and difficult to manage drug allergies [2]. Taking multiple medications – known as 'polypharmacy' – increases the risk of medications being implicated in hospital admissions, particularly when an older person presents with falls, confusion or incontinence. Polypharmacy can cause problems due to prescribing errors, problems with taking the medicines, and interactions of medicines[12]. According to research, The incidents of adverse drug effect reactions in hospitals are about 3 percent in an age group of 10 to 30 years and about 25 percent in case of elderly patients above the age of 80 years as these patients are more susceptible to adverse drug effects. Medicines can be problematic for older people because as we age physiological changes can affect the way our body absorbs, distributes, metabolises and eliminates drugs. These physiological changes include increased body fat, decreased body water, decreased muscle mass, and changes in renal and liver function and in the Central Nervous System [12]. Several studies and researches on older person that has documented the pharmacological alteration of drugs recommends the choice of safer and more effective drugs for elder population [3].

Geriatric Pharmacokinetics & Pharmacodynamics:

With age there are several physiological changes that occurs in the body. There is also an alteration in the metabolism. These changes have important implications for the clinical management of elderly patients. changes in response to commonly used drugs make different drug dosages necessary and there is need for rational preventive programs of diet and exercise in an effort to delay or reverse some of these changes. Due to change in body weight with age, several changes in pharmacokinetics are seen in many elderly people. Parameters like changes in volume of distribution and renal clearance must be given proper clinical importance. There is low grade evidence for age-related changes for drugs absorbed by passive diffusion there. In general no adaptation of the dose is needed because of the ageing process. First-pass metabolism reduces with advancing age. This is probably due to a reduction in liver mass and, for high clearance drugs, the consequential reduction in blood flow. The bioavailability of drugs which undergo extensive first-pass metabolism such as opioids and metoclopramide, can be significantly increased. For these drugs a low start dose is advised. To study about drug sensitivity, it require measurement of drug concentrations in plasma, as well as its effects. Pharmaco dynamics are determined on the basis of drug concentrations at the receptor, drug receptor interactions, variations in receptor number, receptor affinity, second messenger response, and cellular response, and homeostatic regulation [16,17].

Disease based pharmacology:

With age certain diseases develop that are not typically developed by younger people. Issues like cardiovascular disease, ischemic heart disease, urinary incontinence, vascular dementia, multiple sclerosis, etc are commonly seen in the older generation worldwide. Ischemic Heart Disease and Dyslipidaemia or Hypercholesterolemia are commonly presented parallel to one another [1,5]. Also with time and age hypertension can add up to Chronic Kidney Disease. Hence the drug of choice should be based of treatment of both the hypertension and dyslipidaemia that would be also safe for kidneys without triggering the chronic kidney disease in a long run. In case the patient already has both hypertension and chronic kidney disease, A combination of antihypertensive drugs and appropriate diuretic choice, based on estimated glomerular filtration rate, is a key component of hypertension management in CKD patients. Lifestyle modification such as restriction of dietary salt are also included as a part of the treatment [6,7].

Diseases such as Type 2 diabetes mellitus and osteoarthritis are co-existing and are often seen in individuals with obesity or are overweight. These patients also present with other co-morbidities like hypertension, constipation or could be renal compromised. Medications such as Beta- Blockers for hypertension, Lactulose for constipations, NSAIDS for osteoarthritis or even Thiazides can contribute to aggravation of Type 2 Diabetes Mellitus. In some cases the development of drug induced diabetes may be reversible if the medication is discontinued, but in other cases this may be permanent. For example if corticosteroids are taken over longer periods of time, it can sometimes lead to the development of type 2 diabetes permanently. Similarly Beta-blockers can reduce sensitivity to insulin and can therefore raise the risk of developing type 2 diabetes [8].

Another major pharmacological risk for elderly patients is development or aggravation of kidney problems. Developing an acute Kidney Injury or aggravation of chronic kidney disease can also occur due to several diagnostic and treatment procedures in elderly people. It is particularly important not only to know the nephrotoxic potential of the different drug groups, but especially to recognize the patient's risk factors that could be modified or that should preclude the use of these drugs. In presence of co-morbid conditions such as diabetes mellitus and congestive heart failure significantly influences the patient's ability to recover from the toxic effects.

Some patient-related risk factors for drug-induced nephrotoxicity are age older than 60 years, underlying renal insufficiency (e.g., glomerular filtration rate below 60 mL per minute per 1.73 m^2), volume depletion, diabetes, heart failure, and sepsis.

General preventive measures include using alternative non-nephrotoxic drugs whenever possible; correcting risk factors, if possible; assessing baseline renal function before initiation of therapy, followed by adjusting the dosage; monitoring renal function and vital signs during therapy; and avoiding nephrotoxic drug combinations. Direct acute tubular injury develops from several medications, which are toxic to various cellular functions. Their excretory pathways through the proximal tubules contribute further to AKI. Drug-induced AKI may also develop through induction of inflammation within the tubule-interstitial layer. Medications can elicit a T cell-mediated immune response that promotes the development of acute interstitial nephritis leading to AKI[9,10].

Third most commonly presented disease in the elderly population is Osteo-Arthritis and Osteoporosis. Osteoarthritis occurs due to the breaking or wearing of the cartilages that cushions the ends of the bones within the joints, leaving bones that rub up against each other. This causes inflammation and pain in between joints. According to the National Institute on Ageing- Osteoarthritis is the most common form of arthritis among older people, and it is one of the most frequent causes of physical disability among older adults. It is common for both men before 45 years and in women after 45 years [13]. Osteoarthritis treatment plans often include exercise, rest and joint care, pain relief, weight control, medicines, surgery, and complementary treatment approaches. Current treatments for osteoarthritis can relieve symptoms such as pain and disability, but there are no treatments that can cure the condition. Few prophylactic drugs like Acetaminophen that can help some people with osteoarthritis who have mild to moderate pain although it also has a risks of contributing to liver damage. Over-the-counter NSAIDs like ibuprofen and naproxen sodium taken at the recommended doses, typically relieve osteoarthritis pain but also can contribute to several gastric complications such as gastritis, cardiovascular problems, bleeding problems, liver and kidney damage [13,14]. On the other hand, Osteoporosis is a disease in which bone strength declines and the risk of fractures increases. As per World Health Organization, decrease in bone mineral density (BMD) below 2.5 considered to be a definitive features of osteoporosis. Women over 70 years and men over 80 years are usually at high risk of fracture. Fractures are more common in the hip joint and the pelvis. A sufficient supply of calcium and vitamin D is obligated to use before use of specific osteoporosis medication. Most of the approved anti osteoporotic drugs are well tolerated and reduce the risk of fractures even in geriatric patients. However the therapy of osteoporosis in geriatric patients is always an individualized therapy [15].

Apart from these there are also many more possible complications that can be more challenging and devastating if not correctly taken care off.

Pharmacology and Ageing:

Ageing is the term coined to describe the process of growing. Apart from internal diseases, a bigger attention is also drawn to the fact of skin and cosmetic changes that comes with ageing. Therapeutic handouts like plant based phytochemical provides multiple beneficial properties for skin, related to UV protection, antioxidant action, matrix protection and skin hydration. Lot of phytochemicals from the plant extracts have been explored and their biological activities well-studied over several years. Therefore, there is a continuous requirement of understanding the concentration of the ingredient in herbal products, their formulation, safety, and the anti-ageing effect duration [18]. Medicines can be problematic for older people because as we age physiological changes can affect the way our body absorbs, distributes, metabolises and eliminates drugs. These physiological changes include increased body fat, decreased body water, decreased muscle mass, and changes in renal and liver function and in the Central Nervous System [12]. In most developed countries, about 2/3 of the population ≥65 years take prescription and over the counter (OTC) drugs. At any given time, an average elderly person uses 4-5 prescription drugs and two OTC drugs and fills 12–17 prescriptions a year. The most commonly used OTCs are, paracetamol, NSAIDs, antihistamines, drugs for gastric complaints like H_2 receptor antagonists, statins and proton-pump inhibitors, etc [16]. As more older adults experience more age related changes, geriatric medicine will become an increasingly important part of their medical regimen. Older patients who are managing a chronic condition can benefit from the support of a home health care team. In addition to healthy eating and a healthy lifestyle, regular contact with reliable health professionals can help prevent poor health [1].

CONCLUSION:

Older persons have a significantly higher disease burden compared with younger adults. Older adults should consider having a chronic care management team in place to help them achieve their health goals and maintain their quality of life. This is especially true of elderly patients who are managing multiple chronic conditions at a time. Its more important to choose more target specific and safe drugs after properly studying the risk is to benefit ratio. Plant based medications are well preferred for external uses especially for cosmetic purposes but that too after proper allergic profiling. For the OTC drug use, in case of elderly patients its necessary to monitor the regular medications to prevent any severe acute or chronic drug adversity. Recently, interest in pharmacology education has increased, possibly because of the high rate of medication errors and the recognized importance of evidence-based medical education. Improvements in education in general and geriatric pharmacology are suggested.

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