

Prescribing Practice for Geriatric Patients in Selected Hospitals

**A research paper submitted to the Department of Pharmacy,
East West University in conformity with the requirements for the
Degree of Masters of Pharmacy.**

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***THIS PAPER IS DEDICATED TO MY
PARENTS***

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Certificate

This is to certify that the thesis "Prescribing Practice for Geriatric Patients in Selected Hospitals" submitted to the Department of Pharmacy, East West University, Dhaka for the partial fulfillment of the requirements for the degree of Masters of Pharmacy/(M.Pharm) was carried out by Khandoker Sirajul Munir (ID:2011-1-79-003) under my guidance and supervision and that no part of our thesis has been submitted for any other degree. We further certify that all the sources of information and facilities available of this connection is duly acknowledged.

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Abstract

Due to the improvement of medical facility the elderly population in Bangladesh continues to rise. Management of many acute and chronic disease for the aging population have contributed to wide-rangemedication use among aged patients, these circumstances may lead to drug related problem (DRPs) especially unnecessary drug therapy. The aim of this study was to identify unnecessary drug therapy on outdoor geriatric patients and to investigate whether polypharmacy is a suitable indicator for occurrence of redundant or irrational drug therapy in a hospital outdoor patients.

Research type was cross-sectional. Data taken through preformed questionnaire among outdoor geriatric patients. The study was conducted with inclusion criteria: patient with 60 year and above. Total of 120 patients were under study during a 7-month period from February, 2013 to August, 2013. An average of 4.30 drugs was prescribed. 50% of the drugs were prescribed by generic name & 50% in brand name. Polypharmacy was observed in 35.83% of total patients. The maximum number of 12 prescribed drugs were received by 0.84% patients. Among the total patients 6.66% patients receive single drug. 30% of patients received 5-7 medicine & 5% of patients received 8-10 drugs. About 24.16% were prescribed antibiotics and 10.19% of total drug was combination of calcium carbonate and vitamin D. Most of the geriatric patients (89.16%) were counseled for more than 5 minutes.

Prevention of redundant drug therapy problem can be conducted through promoting the rational use of drug (it is recommended to reduce all medications without therapeutic benefit, goal or indication). This study exposes the prescription trends, and indicates possible areas of improvement in prescribing practice.

1.0 Overview

The elderly population is increasing rapidly worldwide. Individual differences in age related pharmacokinetic & pharmacodynamic changes as well as co-morbid conditions have to be considered while prescribing medicines in elderly population. Changes in the pharmacokinetic profiles of drugs occur in the elderly because of reduced body water, reduced renal and hepatic function and increased body fat. Multiple drug use & polypharmacy is highly prevalent in elderly exposing them to drug interactions & increased cost of therapy. (Veena D.R, Padma L, Sapna Patil, 2012)

The field of ageing and health has become a dominant area of concern in the 21st century. This is due to an increase in the absolute and relative numbers of older people in both developed and developing countries. In the year 2000, there were an estimated 600 million people aged 60 years and above in the world. By 2025, this would double to about 1.2 billion people; and by 2050 there will be 2 billion, with 80 percent of them living in developing countries. The rapidly growing numbers and proportion of elderly mean that more people will be entering a period of life where the risk of developing certain chronic and debilitating disease is significantly higher. People over the age of 65 years are more likely to be on medication than younger people. They are often taking several drugs at once to treat concomitant disease processes. The use of several drugs concomitantly is justified in the treatment of multiple chronic disease may cause polypharmacy.

The unnecessary drug therapy problems frequently tend to be overlooked in polypharmacy prescribing. Drug therapy is considered unnecessary for the patient if there was not or there is no longer a valid medical indication for a particular drug. (Rahmawati & Sulaiman, 2009)

Between 1991 and 2031 the total population of England and Wales is expected to increase by 8%. However, the numbers of those aged between 60 and 74 years will rise by 43%, those aged between 75 and 84 by 48% and those aged over 85 years by 138%. The significant increase in the number of very elderly people will have important social, financial and healthcare planning implications. (Walker & Whittlesea, 2007)

The diagnostic process for the elderly necessarily needs to be different in that the patient medications' regimens should be reviewed. With increasing age, multi-morbidity becomes more frequent, leading to higher occurrence of medication use and higher risk of adverse drug reactions due to polypharmacy, chronic diseases, and age-related changes in pharmacokinetics (absorption, distribution, and elimination of a drug in the body) and pharmacodynamics (the pharmacologic effect and clinical response to the drug). (Beers & Jones, 1995)

Institutionalized patients tend to be on larger numbers of drugs compared with patients in the community. Patients in long term care facilities have been shown to be receiving on average eight or more drugs. For optimal drug therapy in the elderly, knowledge of age-related physiological and pathological changes that might affect handling of and response to, drug is essential. (Walker & Whittlesea, 2007)

The objective of the study is to identify irrational drug therapy on geriatric patients in selected hospitals in Bangladesh. The research also aims to investigate whether polypharmacy is a suitable indicator for occurrence of Irrational drug therapy in a hospital setting.

2.0 Irrational use of drug

World Health Organization defined Irrational use of drug as “Patients receive medications with Wrong clinical diagnosis, Wrong selection of drugs, Wrong doses, Wrong route of administration, Wrong duration, Wrong patients, Wrong information and interpretation.

Medically inappropriate, ineffective, and economically inefficient of drugs is commonly observed in health care system throughout the world specially in developing countries. Very often this problems of IRDUs remain unnoticed by health care providers, policy makers or manager’s responsible for drug management. There are various pattern of irrational use of drug such as Use of drugs where no drug therapy is indicated e.g. antibiotics in viral upper respiratory tract infection , Use of wrong drug for a specific condition e.g. antibiotics in childhood diarrhea which requires ORS, Use of drugs with doubtful efficacy e.g. use of anti-motility drugs in diarrhea, vinpocetine in stroke, Use of correct drugs with incorrect administration, doses and duration e.g. oral use of metronidazole in acute gram negative sepsis not effective where iv metronidazole therapy is required Indiscriminate use of injection e.g. treatment of malaria, Multiple or over prescription (polypharmacy) for treating minor infection, e.g. anti-diarrheals for non-specific diarrhea, multivitamins and tonics to correct malnutrition, Use of anabolic steroids to promote growth and development, Underuse of effective drugs which exist for treating conditions like hypertension, psychological depression, anemia during pregnancy, Underuse of life-extending drugs for treating illness like HIV/AIDS, hepatitis, CADs, diabetes etc.

3.0 Polypharmacy

Polypharmacy is defined as the practice of prescribing four or more medications to the same person¹. When the number of drugs prescribed totals five or more (major polypharmacy), a significant risk may be present. (Lohani & Thapa, 2003)

reactions, difficulties of compliance and errors)are now used more frequently, describing morerelevant concerns about the quality of the med-ications used by the elderly population. Data concerned with polypharmacy andadverse drug events are variable. Among the limitations noted are unrecognized cases, and difficulties in determining a cause-and-effect relationship between the medication(s) and the multiple conditions of the elderly. Limitations also include lists of medications to be avoided by older individuals. These are not consistent from one study to another and do not take into consideration the specific medical conditions of each patient. Adverse drug events can be the cause of falls, fractures, cognitive dysfunction, postural hypotension, electrolyte disorders and cardiac failure and are responsible for up to 23% of hos-pital admissions in the elderly (Serge Brazeau, 2001)

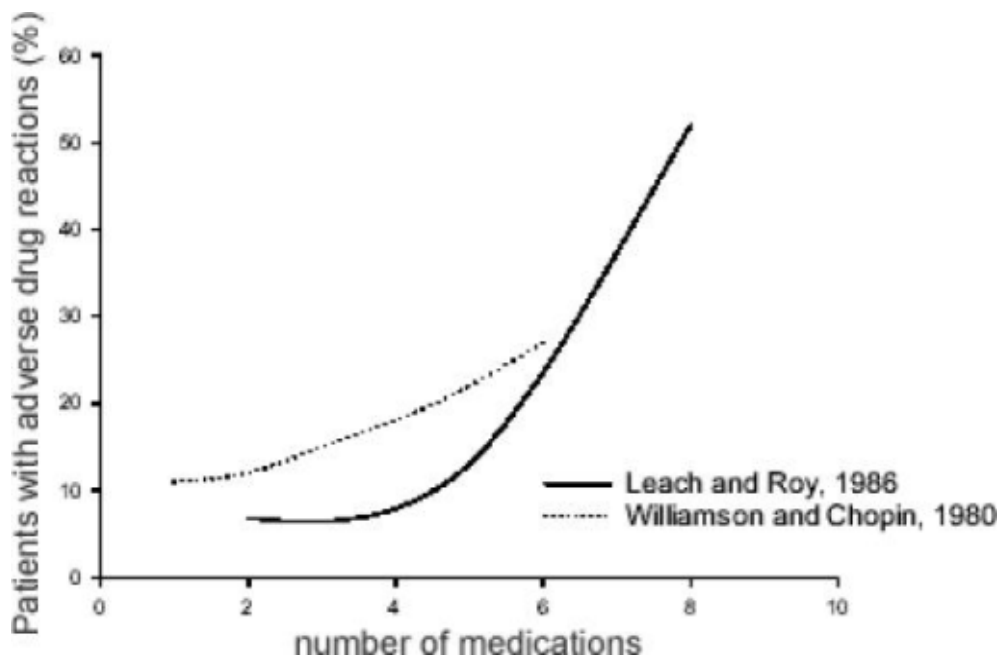
Chronic illness increases with increasing age and elderly people are more likely to have conditions that require multiple drug treatment. The greater the number of drugs patient receives, the higher the chances of drug interactions. Due to physiological changes in the elderly, the pharmacokinetic and pharmacodynamics of the drug may be altered and may lead to adverse drug reactions, medication errors, longer duration of hospital stay and increased treatment cost. Aging, pre-existing diseases, dietary habits, smoking, alcoholism and increased use of drugs are all factors that contribute to the development of adverse drug reactions and medication errors. Therefore, formulating an optimum drug regimen that meets the complex need of elderly people requires careful and rational prescribing. (Lohani & Thapa, 2003)

Multiple definitions are used in the literature for polypharmacy such as two or more drugs for 240 days or more.(Veehof & Stewart, 2000) .

Concurrent use of two or more drugs, use of four or more medications.(Bjerrum, 2003)

Use of five or more different prescription medications.(Bikowski & Ripsin, 2001)

Fig. 1.0: Adverse drug reaction with increased number of drugs.



Additional definitions include regular daily consumption of multiple medications as well as the use of high-risk medications and questionable dosing.(Golden & Preston, 1999)

European studies defined polypharmacy according to the number of medications taken, whereas the studies conducted in the United States defined polypharmacy according to whether a medication was clinically indicated.

World Health Organization defined Polypharmacy as “Use of more medications than clinically necessary” .

4.0 Geriatrics

Geriatrics is best described as the branch of medicine that focuses on health promotion and prevention and treatment of diseases and disability of elderly patients. Its focus is to prevent and treat disease and disability, as well as promote general health of seniors.

There is no specific age at which a patient is prescribed geriatric treatments, as this is generally determined by the patient's profile, and the symptoms that the patient suffers from. Some of the most common treatments are for immobility, incontinence and degradation of memory. Geriatrics may also include elderly care for delirium, impaired vision or hearing, and many other discomforts and diseases that older patients can suffer from. (Chrischilles & Foley, 1992)

Geriatrics is also defined as "the branch of medicine concerned with the physiological and pathological aspects of the aged, including the clinical problems of senescence and senility. (Abramson & Porta, 1995)

In the United States, primary care providers that are board certified in either family practice or internal medicine and also have completed the training required to receive a Certificate of Added Qualifications in geriatric medicine are known as geriatricians. However, in the United Kingdom, geriatricians are usually just hospital physicians. Occasionally, some concentrate solely on community geriatrics.

Some of the more specialized geriatrics services include orthogeriatrics, which is a combination of orthopedic surgery and osteoporosis, and psychogeriatrics, which focuses on dementia, depression and other conditions common in the elderly

Geriatrics is the medical specialty which focuses on the care and treatment of the elderly, usually patients who are 65 years of age or older. A physician who practices geriatrics is sometimes called a geriatrician. Geriatricians have trained as family practitioners or as internists initially. If a family practitioner or internist wishes to subspecialize in geriatrics, he or she may do so after completing an additional one or two years of fellowship training. Geriatricians may work in a hospital, hospice, medical office, nursing home, or in a combination of several of these medical facilities.

5.0 Review of literature

5.1. Polypharmacy and Geriatric Patients: Patterns of Prescribing in the Tribhuvan University Teaching Hospital in Nepal:

Polypharmacy is common occurrence in geriatric patients due to multiple illnesses. To analyze prescribing patterns in geriatric patients admitted in Tribhuvan University Teaching Hospital (TUTH), Maharajgunj, Kathmandu, Nepal. Total of 3750 patients were admitted during a 1- year period from 1st July 2002 to 30th June 2003, out of which 546 patients (14.6%) were aged 65 and above. One hundred randomly selected records of geriatric patients admitted to the medical wards of TUTH during the study period was analyzed. The mean duration of hospital stay was 7.7 days. An average of 10.73 drugs was prescribed. The average number of drugs prescribed rises to 13.76 if individual components of the fixed dose product are calculated. The average number of drugs during discharge was 5.13. Intravenous fluids were the most frequently prescribed drugs. About one third (31.03%) of the drugs were prescribed by generic names. Eighty-nine percent of the patients received more than 5 drugs during hospital stay. Of the all drugs prescribed, 63.75% were prescribed from within the National List of Essential Drugs. About three-quarters (73%) were prescribed antibiotics and 72 percent of patients received drugs intravenously. Amoxicillin and Clavulanic acid combination product was most frequently prescribed antibiotic. Major polypharmacy was common in the medical wards of the TUTH. This can misled us while calculating number of drugs prescribed to the patients if all the ingredients of the fixed dose combination products are not considered. (Lohani & Thapa 2003)

5.2. Is Polypharmacy Common Or Avoidable In The Elderly?

This investigation was to find out the prevalence of polypharmacy (defined as > 4 regular oral or injection drugs) and the associated risk factors by a cross-sectional case-control method in our geriatric out-patient clinic. Altogether 837 patients were screened and 60 cases and 60 controls recruited. The prevalence of polypharmacy was 72 per 1000 clinic patients.

The occurrence of polypharmacy has no relationship to sex, age nor institutionalization. Prescription of unnecessary drugs partly accounts for polypharmacy. The significant risk factors for polypharmacy are the number of diagnoses, duration of follow-up period and certain particular diagnoses: hypertension, ischaemic heart disease, COAD, diabetes, gout, and night cramps of calf muscles. The proportion of patients on unnecessary drug is high, 62% in the case group and 30% in the control group. Hence there exists a great potential for regimen simplification to benefit the elderly outpatients in our clinic in terms of better compliance, less drug interactions and adverse drug reactions. (Wai & Keung 1995).

5.3. Adverse drug reactions and polypharmacy in the elderly in general practice:

The risk of adverse drug reactions (ADRs) increases with the number of drugs used. Most studies refer to potential interactions; the results regarding the severity of occurring and registered ADRs are inconsistent. Therefore, we examined the relevance of drug-induced problems in the elderly in general practice and their association with polypharmacy. Retrospective cross-sectional analysis of prospectively collected data. From 2185 elderly patients (>64 years) medication and morbidity data were collected over the period of 2 years (1994 and 1995). The incidence of ADRs in general practice was 5.7 per 100 elderly patients and the prevalence 6.1 per 100. Moderate polypharmacy was more frequent in the elderly who experienced adverse effects no other differences in degree of polypharmacy could be found. The elderly who experienced adverse reactions used overall more different drugs (14.4 . 7.6, of which 1.5 . 1.5 were used long term) than the other elderly patients (8.1 . 5.7, of which 1.0 . 1.5 were long term). The incidence of ADRs increased non-significantly with the number of drugs used long term. (Veehof & Stewart 1999)

5.4. . A survey on polypharmacy and use of inappropriate medication in a geriatric out-patient clinic:

A study on 364 patients in a geriatric out-patient clinic showed that 115 (31.6%) of them had polypharmacy (5 or more prescribed medications) and 28 (7.7%) of them were given

inappropriate medications. Medications identified to be inappropriately used in this study included propoxyphene, dipyridamole, diazepam, metformin in presence of heart failure or renal failure, and diltiazem in presence of heart failure. Chronic obstructive pulmonary disease, coronary heart disease, congestive heart failure, gout, and increasing number of medical diagnoses were found to be significant risk factors for polypharmacy. The use of inappropriate medication was significantly associated with polypharmacy. (Ko & ko 1996)

5.5. Reducing Polypharmacy Through the Introduction of a Treatment Algorithm: Use of a Treatment Algorithm on the Impact on Polypharmacy:

Polypharmacy is very common in the psychiatric setting despite the lack of evidence to justify its use. The objective of this study was to review the prescription patterns in a tertiary mental health institute in Asia and evaluate the impact of a treatment algorithm for patients with first-episode psychosis (FEP) on the use of polypharmacy. A treatment algorithm was implemented for patients accepted into an Early Psychosis Intervention Programme (EPIP) and the prescription patterns of these patients were compared with a comparator group (pre-EPIP) before the use of the algorithm. The prescribing pattern was established at 2 points: at baseline after the diagnosis was made, and 3 months later. There were 68 subjects in the comparator group and 483 EPIP patients; the latter were on the average younger. None in the comparator group was diagnosed to have an affective psychosis. There was a significant reduction in the rate of antipsychotic polypharmacy, prolonged use of benzodiazepines and anticholinergic medication in EPIP patients. This group also had an increase in the use of second-generation antipsychotics and received lower doses of antipsychotics. The implementation of a treatment algorithm coupled with audit has changed the trend towards polypharmacy among patients with FEP. (Chong & Ravichandran 2006)

5.6. Drug utilization and polypharmacy among the elderly: a survey in Rio de Janeiro City, Brazil:

To describe drug utilization by Brazilian retirees with an emphasis on inappropriate use. Cross-sectional study with a simple random sample of 800 retirees of the Brazilian Institute of Social Security, 60 years of age and older, residing in Rio de Janeiro City, through face-to-face interviews. Medication use in the 15 days before the study was reported by 85% of the sample, with a mean of 3.7 products per person (standard deviation = 2.9). About half the sample used one to four medications and a third used five or more. The highest number of drugs used per patient was 24. More women than men used multiple medications. There is a tendency toward positive association ($P < 0.001$) between drug use and variables relating to disease and health care. This trend continues in the analysis by gender. Men who reported five or more diseases were five times more likely to use multiple drugs than men with up to two (zero, one, or two) diseases (prevalence ratio 5.21, 95% confidence interval = 2.48–10.90). Women who reported five or more diseases were nearly four times more likely to use multiple drugs than women with up to two diseases (prevalence ratio 3.67, 95% confidence interval = 2.24–6.02). Of the active substances used by the sample, 10% were considered inappropriate. To improve drug therapy for the elderly, health practitioners can take measures to reduce unwarranted use of medication and to optimize the benefits from important drugs. Further studies should be conducted to adjust lists of medications inappropriate for the elderly to the situation in developing countries. (Rozenfeld & Fonseca 2008)

5.7. Polypharmacy and unnecessary drug therapy on geriatric patients in Yogyakarta Hospitals, Indonesia:

The elderly population in Indonesia continues to rise. The pharmacologic management of many acute and chronic conditions and the aging population have contributed to increase medication use among elderly patients, these situation may lead to drug related problem (DRPs) especially unnecessary drug therapy. The aim of this study was to identify unnecessary drug therapy on hospitalized geriatric patients, to calculate the waste of cost spent on unnecessary drugs and to investigate whether polypharmacy is a suitable indicator for occurrence of unnecessary drug therapy in a hospital sitting.

Research type was observational. Data taken through medical record in 100 geriatric patients hospitalized in two hospitals in Yogyakarta Indonesia. The study was conducted by accidental sampling with inclusion criteria: patient with 65 year and above, complete medical record, patient admitted to Internal Medicine Department during 2006 - 2007. Unnecessary drug therapy was identify through discussion forum involve clinical pharmacist and senior geriatric consultant. Comparison were made between patients received five drugs or less/day (group A) and with more than five drugs/day (group B) during the hospital stay.

Our research found unnecessary drug therapy occurred in 63 cases (63 %) with total 117 incidences. Total expense of unnecessary drug therapy equal to Rp.12.553.349,00 (US\$ 1.046, 11). Of the 100 patients, 24 % received more than five drugs/day during the hospital stay. Number of unnecessary drug therapy incidence in patients with five drugs or less/day was lower than patients with more than five drugs/day during the hospital stay: 0.78 vs 1.91 respectively (P = 0.000). Prevention of unnecessary drug therapy problem can be conducted through reduction of drug use (it is recommended to eliminate all medications without therapeutic benefit, goal or indication). Prevention of unnecessary drug therapy will also contribute in cost saving among elderly patients. (Rahmawati & Sulaiman 2009)

5.8 Polypharmacy and inappropriate prescribing in elderly internal-medicine patients in Austria:

The aim of the study was to assess the prevalence of polypharmacy and inappropriate drug use in elderly internal-medicine patients in one Austrian center and to define the impact of these and other identified predictors on the occurrence of adverse drug events. All patients ≥ 75 years admitted to selected internal wards of a university hospital were included in a monocentric prospective cohort study over a period of three months. The pre-admission medication of the patients was analyzed with respect to appropriateness by a multidisciplinary team consisting of pharmacists and physicians trained in internal medicine. The medication was evaluated for the occurrence of adverse drug events. A total of 543 patients were analyzed (median age 82 years; 60.2% female). The mean

number of drugs taken was 7.5 ± 3.8 , with women taking significantly more drugs than men (7.8 vs. 6.8, $P = 0.013$). Overall, 58.4% of the patients fulfilled the given criteria for polypharmacy (> 6 drugs). The following factors were associated with polypharmacy: female sex, need for nursing care, high number of discharge diagnoses and high Charlson comorbidity score. Unnecessary drugs were found prescribed in 36.3% of all patients, drugs to avoid (Beers criteria) in 30.1%, duplication in 7.6%, wrong dosage in 23.4% and possible drug-drug interactions in 65.8%. Adverse drug events were identified in 17.8% of the patients (97/543), among whom the adverse drug event was the reason for hospital admission in 56.7% of the cases and a drug-drug interaction was involved in 18.7%. Risk factors for adverse drug events were female sex, polymorbidity, renal dysfunction and inappropriate prescribing. Polypharmacy, inappropriate prescribing and adverse drug events were highly prevalent in a cohort of elderly internal-medicine patients in Austria. To improve drug safety in this high-risk population, appropriate prescribing might be more important than simply reducing the number of prescribed drugs. (Schuler & Dückelmann 2008)

6.0 Physiology of geriatric patient

Aging results in many physiological changes that could theoretically affect absorption, first pass metabolism, protein binding, distribution and elimination of drugs. Age related changes in the gastrointestinal tract, liver and kidneys include reduced following phenomena:

1. Gastric acid secretion
2. Gastrointestinal motility
3. Total surface area of absorption
4. Splanchnic blood flow
5. Liver size
6. Liver blood flow
7. Glomerular filtration
8. Renal tubular filtration. (Walker & Whittlesea, 2007)

6.1 Pharmacodynamics of geriatric patients

Changes in pharmacodynamics in geriatric patient may be considered under two headings:

6.1.1 Reduced homeostatic reserve

Orthostatic circulatory responses:

In normal elderly subjects there is blunting of the reflex tachycardia that occurs in young subjects or in response to vasodilation. Structural changes in the vascular tree that occur with ageing are believed to contribute to this observation, although the exact mechanism is unclear. Antihypertensive, antidepressant, antiparkinsonism drugs are therefore more likely to produce hypotension in the elderly.

Postural control:

With ageing the frequency and amplitude of corrective movements increase and an age-related reduction in dopamine receptors in the striatum has been suggested as the probable cause.

Thermoregulation:

There is an increased prevalence of impaired thermoregulatory mechanisms in the geriatric patient.

Cognitive function:

Ageing is associated with marked structural and neurochemical changes in the central nervous system. Cholinergic transmission is linked with normal cognitive function and in the elderly the activity of choline acetyltransferase, a marker enzyme for acetylcholine, is reduced in some areas of the cortex and limbic system. Several drugs cause confusion in the elderly: anticholinergics, hypnotics, H₂ antagonists and β -blockers are common examples.

Visceral muscle function:

Constipation is a common problem in the elderly as there is a decline in gastrointestinal motility with ageing. Anticholinergic drugs, opiates, tricyclic antidepressants and antihistamines are more likely to cause constipation or ileus in the elderly.

6.1.2 Age related changes in specific receptors and target tissue

Ageing is associated with some changes resulting in impaired enzyme activation and signal amplification and cause altered response to the target tissue.

 α -Adrenoceptors:

α -Adrenoceptors responsiveness appears to be reduced with ageing.

 β - Adrenoceptors:

an age related reduction in β -Adrenoceptors density has been shown in animal adipocytes, erythrocytes and brain.

Cholinergic system:

The effect of ageing on cholinergic mechanism is less well known. Atropine produces less tachycardia in elderly humans than in the young.

Besides this geriatric patients are more sensitive to benzodiazepines, warfarin, and digoxin.

Other Pharmacodynamics consideration

- The older patient's central nervous system is often more sensitive to agents such as antipsychotics, opioids, benzodiazepines and anti-Parkinsonian agents.
- Drugs which have toxic gastrointestinal side effects, such as non-steroidal anti-inflammatories (NSAIDs) and opioids, must be used with caution.
- Particular care must be taken with central nervous system-active drugs that affect balance, wakefulness, motor function and perception in the older patient prone to falls; address the need for prophylactic treatments to make fractures less likely in

older patients on medication that makes them prone to falls.(Walker & Whittlesea, 2007)

6.2 Pharmacokinetics of geriatric patient

Absorption:

There is a delay in gastric emptying, reduction in gastric acid output and splanchnic blood flow with aging. These changes do not significantly affect the absorption of the majority of drugs. Although the absorption of some drugs such as digoxin may be slower, the overall absorption is similar to that in the young.(Walker & Whittlesea, 2007)

First-pass metabolism:

After absorption, drugs are transported via the portal circulation to the liver, where many lipid-soluble agents are metabolized extensively (more than 90-95%), this results in a marked reduction in systemic bioavailability. Impaired first-pass metabolism has been demonstrated in the elderly for several drugs, including clomethazole, labetalol, nifedipine, nitrates, propranolol and verapamil.

Distribution:

The age related physiological changes which may affect drug distribution are:

1. reduced lean body mass
2. reduced total body water
3. increased total body fat
4. lower serum albumin level
5. α_1 - acid glycoprotein level unchanged or slightly raised.

Table 1.0: Effects of aging on volume of distribution.(Farho L, 2007)

Aging effect	Volume of distribution effect
Decreased body weight	Decreased volume of distribution of hydrophilic drug.
Decreased lean body weight	Decreased volume of distribution of drugs that binds to Muscle.
Decreased plasma protein	Increased % of unbound or free drug (active).
Increased plasma protein	Decreased % of unbound or free drug (active).

Renal clearance:

There is a considerable interindividual variability in renal function in the geriatric patient. In general the glomerular filtration rate declines as do the effective renal plasma flow and renal tubular function. Because of the marked variability in renal function in the geriatric patients.

Hepatic clearance:

Hepatic clearance of a drug is dependent on hepatic blood flow and the steady-state extraction ratio. Impaired clearance of many hepatically eliminated drugs has been demonstrated in the geriatric patient. Morphological changes rather than impaired enzymatic activity appear to be the main cause of impaired elimination of these drugs.

Other pharmacokinetic considerations in older patients include:

- Drug absorption changes little but there may be a significant increase in the absorption of levodopa.
- Bioavailability may be increased for drugs which are extensively metabolized in the liver, e.g. propranolol, verapamil and many psychotropics, due to loss of first pass metabolism; interactions can be a problem with multiple therapy and drugs cleared by the liver should be used with extreme caution in older patients with hepatic impairment.
- The apparent volume of drug distribution is altered in older people due to changes in lean body mass; there may be a reduction in drug distribution volume for some

water-soluble drugs, e.g. digoxin, and an increase for lipophilic drugs, e.g. diazepam.

- Protein binding may be altered but is not usually a problem associated with normal ageing; however, disease which reduces albumin levels is more common in the elderly and should be borne in mind when prescribing heavily protein-bound drugs such as warfarin and sulphonylureas.
- Long term use of thiazide diuretics causes only a small change in body potassium in the middle-aged but is a major cause of deficiency in the elderly due to reduced dietary intake. (Walker & Whittlesea, 2007)

7.0 Common clinical disorders of geriatric patients

This topic deals in detail only with the most important geriatric diseases. Other conditions are mentioned primarily to highlight areas where the elderly differ from the young or where modifications of drug therapy are necessary. The list of common clinical disorders according to Walker & Whittlesea (2007) are given below:

1. Dementia
2. Parkinsonism
3. Stroke
4. Osteoporosis
5. Arthritis
6. Hypertension
7. Myocardial infarction
8. Cardiac failure
9. Leg ulcer
10. Urinary incontinence
11. Constipation
12. Gastrointestinal ulceration and bleeding. (Walker & Whittlesea, 2007).

7.1 Arthritis

Osteoarthritis, gout, pseudogout, rheumatoid arthritis and septic arthritis are important joint diseases in the elderly. There are over 100 different forms of arthritis. The most common form, osteoarthritis (degenerative joint disease) is a result of trauma to the joint, infection of the joint, or age. Other arthritis forms are rheumatoid arthritis, psoriatic arthritis, and autoimmune diseases in which the body attacks itself. Septic arthritis is caused by joint infection. The major complaint by individuals who have arthritis is pain. Pain is often a constant and daily feature of the disease. The pain may be localized to the back, neck, hip, knee or feet. The pain from arthritis occurs due to inflammation that occurs around the joint, damage to the joint from disease, daily wear and tear of joint, muscles strains caused by forceful movements against stiff, painful joints and fatigue. The most important factor in treatment is to understand the disorder and find ways to overcome the obstacles which prevent physical exercise. (Walker & Whittlesea, 2007)

7.2 Myocardial infarction (MI)

Myocardial infarction (MI) or acute myocardial infarction (AMI), commonly known as a heart attack, is the interruption of blood supply to part of the heart, causing heart cells to die. This is most commonly due to occlusion (blockage) of a coronary artery following the rupture of a vulnerable atherosclerotic plaque, which is an unstable collection of lipids (fatty acids) and white blood cells (especially macrophages) in the wall of an artery. The resulting ischemia (restriction in blood supply) and oxygen shortage, if left untreated for a sufficient period of time, can cause damage or death (infarction) of heart muscle tissue (myocardium). Classical symptoms of acute myocardial infarction include sudden chest pain (typically radiating to the left arm or left side of the neck), shortness of breath, nausea, vomiting, palpitations, sweating, and anxiety (often described as a sense of impending doom). Women may experience fewer typical symptoms than men, most commonly shortness of breath, weakness, a feeling of indigestion, and fatigue. Approximately one quarter of all myocardial infarctions are silent, without chest pain or other symptoms.

7.3 Stroke

A stroke (sometimes called a cerebrovascular accident (CVA)) is the rapidly developing loss of brain function(s) due to disturbance in the blood supply to the brain, caused by a blocked or burst blood vessel. Stroke is the third most common cause of death and the most common cause of adult disability in U.K. This can be due to ischemia (lack of blood flow) caused by thrombosis or arterial embolism or due to a hemorrhage.

Treatment of acute stroke:

1. Thrombolytic agent: The national institute of Neurological disorder and stroke (1995) in the U.S.A. showed that, compared with placebo, thrombolysis with tissue plasminogen activator (rt-PA) within three hours of onset of ischaemic stroke improved clinical outcome at 3 months despite increased incidence (6%) of symptomatic intracranial bleeding.
2. Antiplatelet therapy: Aspirin in doses of 150-300mg commenced within 48 hours of onset of ischaemic stroke has been shown to reduce the relative rate of death or dependency by 2.7% up to 6 month after the event two large studies.
3. Anticoagulation: Use of intravenous unfractionated heparin and low molecular weight heparin has not been shown to be beneficial.

Neuroprotective agents: A large number of Neuroprotective agents has been used for treatment of acute ischaemic stroke but none has been shown to have long term beneficial effects. (Walker & Whittlesea, 2007)

7.4 Hypertension

Hypertension is an important risk factor for cardiovascular and cerebrovascular disease in the elderly. The incident of myocardial infarction is 2.5 times higher, and that of cerebrovascular accidents twice as high in elderly hypertensive patients compared with non-hypertensive subjects. Hypertension (HTN) or high blood pressure is a chronic medical condition in which the blood pressure is elevated. It is classified as either primary (essential) or secondary. The term primary hypertension is used when no medical cause can be found and represents about 90-95% of cases. Secondary hypertension is the result of another condition, such as kidney disease. Persistent hypertension is one of the

risk factors for strokes, heart attacks, heart failure and arterial aneurysm, and is a leading cause of chronic renal failure. Moderate elevation of arterial blood pressure leads to shortened life expectancy. Both dietary and lifestyle changes as well as pharmaceuticals can improve blood pressure control and decrease the risk of a poor outcome.

7.5 Dementia

Dementia is characterized by a gradual deterioration of intellectual capacity. Alzheimer's disease(AD) and multi-infarct dementia(MID) are the most important diseases of cognitive dysfunction in the elderly. Alzheimer's disease (AD) is a slowly progressive disease of the brain that is characterized by impairment of memory and eventually by disturbances in reasoning, planning, language, and perception. Many scientists believe that Alzheimer's disease results from an increase in the production or accumulation of a specific protein (beta-amyloid protein) in the brain that leads to nerve cell death.

The likelihood of having Alzheimer's disease increases substantially after the age of 70 and may affect around 50% of persons over the age of 85. Nonetheless, Alzheimer's disease is not a normal part of aging and is not something that inevitably happens in later life. For example, many people live to over 100 years of age and never develop Alzheimer's disease.

MID is the second most important cause of dementia. It usually occurs in patients in their 60s and 70s, and is more common in those with a previous history of hypertension or stroke. Mood changes and emotional lability are common. There may be local neurological deficit.(Walker & Whittlesea, 2007)

Non-steroidal anti-inflammatory drugs (NSAIDs) can decrease the risk of developing Alzheimer's and Parkinson's diseases. The length of time needed to prevent dementia varies, but in most studies it is usually between 2 and 10 years. Research has also shown that it must be used in clinically relevant dosages and that so called "baby aspirin" doses are ineffective at preventing and treating dementia.

Alzheimer's disease causes inflammation in the neurons by its deposits of amyloid beta peptides and neurofibrillary tangles. These deposits irritate the body by causing a release of, e.g., cytokines and acute phase proteins, leading to inflammation. NSAIDs inhibit the formation of such inflammatory substances, and prevent the deteriorating effects. Cholinesterase inhibitors are often used early in the disease course. Cognitive and behavioral interventions may also be appropriate. Educating and providing emotional support to the caregiver is of importance.

7.6 Parkinsonism

Parkinsonism is a relatively common disease of the elderly with a prevalence of between 50 and 150 per 100000. Parkinsonism (also known as Parkinson's syndrome, atypical Parkinson's, or secondary Parkinson's) is a neurological syndrome characterized by tremor, hypokinesia, rigidity, and postural instability. The underlying causes of parkinsonism are numerous, and diagnosis can be complex. While the neurodegenerative condition Parkinson's disease (PD) is the most common cause of parkinsonism, a wide-range of other etiologies can lead to a similar set of symptoms, including some toxins, a few metabolic diseases, and a handful of non-PD neurological conditions. Its most common cause is as a side effect of medications, mainly neuroleptic antipsychotics especially the phenothiazines (such as perphenazine and chlorpromazine), thioxanthenes (such as flupenthixol and zuclopenthixol) and butyrophenones (such as haloperidol (Haldol)), piperazines (such as ziprasidone), and rarely, antidepressants. (Walker & Whittlesea, 2007).

7.7 Osteoporosis

Osteoporosis is a disease of bones that leads to an increased risk of fracture. In osteoporosis the bone mineral density (BMD) is reduced, bone microarchitecture is disrupted, and the amount and variety of proteins in bone is altered. Osteoporosis is defined by the World Health Organization (WHO) in women as a bone mineral density 2.5 standard deviations below peak bone mass (20-year-old healthy female average) as measured by DXA; the term "established osteoporosis" includes the presence of a fragility fracture.

Osteoporosis is most common in women after menopause, when it is called postmenopausal osteoporosis, but may also develop in men, and may occur in anyone in the presence of particular hormonal disorders and other chronic diseases or as a result of medications, specifically glucocorticoids, when the disease is called steroid- or glucocorticoid-induced osteoporosis (SIOP or GIOP). Given its influence in the risk of fragility fracture, osteoporosis may significantly affect life expectancy and quality of life

Disease of the parathyroid glands (hyperparathyroidism) is also a major cause of osteoporosis. Hyperparathyroidism should be high on the list of causes in any patient with severe osteoporosis, osteoporosis occurring at a young age, or osteoporosis in a male.

Over consumption of dietary protein is another often neglected cause of osteoporosis. The excess protein causes calcium to be taken from the bones and excreted in the urine.

Osteoporosis can be prevented with lifestyle changes and sometimes medication; in people with osteoporosis, treatment may involve both. Lifestyle change includes exercise and preventing falls as well as reducing protein intake medication includes calcium, vitamin D, bisphosphonates, calcitriol and alfacalcitriol, hormone replacement therapy (HRT), calcitonin, and several others.

7.8 Urinary incontinence (UI)

Urinary incontinence (UI) is any involuntary leakage of urine. It is a common and distressing problem, which may have a profound impact on quality of life. Urinary incontinence almost always results from an underlying treatable medical condition but is under-reported to medical practitioners. There is also a related condition for defecation known as fecal incontinence.

7.9 Insomnia

Sleep disorders are commonly underdiagnosed and a significant source of concern in the geriatric population. several diverse factors may contribute to sleep disturbances in a large proportion of the elderly. These contributing factors include changes associated

with aging, such as retirement, health problems, death of spouse/family members, as well as changes in circadian rhythm. Changes in sleep patterns may be part of the normal aging process; however, many of these disturbances may be related to pathological processes that are not considered a normal part of aging. In addition to affecting quality of life (including excessive daytime sedation, physical, psychological, cognitive problems affecting overall health of the patient), sleep disorders have been implicated with an increased mortality rate. Unfortunately, the number of medications increases with age, which in itself can lead to more morbidity, mortality, side effects such as falls, cognitive impairment, financial stressors, and even sleep disturbances. Treating insomnia in the elderly can improve the overall health of the patient, but care must be taken when medications are used in this particular population. Treatments for sleep disorders include over-the-counter and prescription medications, behavioral treatments, relaxation techniques, sleep hygiene, sleep restriction, light therapy, cognitive behavioral therapies

7.10 Leg ulcers:

Leg ulcers are common in the elderly. They are mainly of two types: venous or ischaemic. Other cause of leg ulcer are blood diseases, trauma, malignancy and infections. (Walker & Whittlesea, 2007)

Table 2.0: Factors that result in the elderly being more at risk of drug related morbidity and mortality:

Pharmacokinetic factors (Factors which affect the concentration and distribution of medicines)	<ul style="list-style-type: none"> • Reduced organ function, particularly for renally excreted medicines and medicines with first-pass hepatic clearance. • Reduced lean muscle and increased fat, resulting in a different distribution of medicines and accumulation
Pharmacodynamic Factors (The effect of medicines at the site)	<ul style="list-style-type: none"> • Increased sensitivity to medicines, particularly anticholinergic medicines and medicines affecting cognitive function

of action)	<ul style="list-style-type: none"> • Impaired homeostatic mechanisms
Physical functional status	<ul style="list-style-type: none"> • Visual problems resulting in difficulty reading instructions or labels to identify the tablets • Hearing problems may mean the patient misunderstands verbal instructions or explanations • Arthritis making opening containers difficult • Reduced muscle tone and balance
Cognitive function	<ul style="list-style-type: none"> • Difficulty remembering new instructions • Compliance issues because of memory or misunderstanding about medicine
Financial factors	The cost of medicines may result in non-collection or poor compliance
Multiple medical Conditions	<ul style="list-style-type: none"> • These usually require multiple medicines, resulting in interactions, particularly when enzyme inducers or inhibitors are required • Disease-medicine interactions

7.11 Constipation

The definition of constipation includes the following:

- infrequent bowel movements (typically three times or fewer per week)
- difficulty during defecation (straining during more than 25% of bowel movements or a subjective sensation of hard stools), or
- The sensation of incomplete bowel evacuation.

The causes of constipation can be divided into congenital, primary and secondary. The most common cause is primary and not life threatening. In the elderly, causes include: insufficient dietary fiber intake, inadequate fluid intake, decreased physical activity, side effects of medications, hypothyroidism, and obstruction by colorectal cancer

The main treatment of constipation involves the increased intake of water, and fiber (either dietary or as supplements). The routine use of laxatives is discouraged, as having a bowel movement may come to be dependent upon their use. Enemas can be used to provide a form of mechanical stimulation. However, enemas are generally useful only for stool in the rectum, not in the intestinal tract.

7.12 Atherosclerosis

Atherosclerosis (also known as arteriosclerotic vascular disease or ASVD) is a specific form of arteriosclerosis in which an artery wall thickens as a result of the accumulation of calcium and fatty materials such as cholesterol and triglyceride. It is a syndrome affecting arterial blood vessels, a chronic inflammatory response in the walls of arteries, caused largely by the accumulation of macrophages and white blood cells and promoted by low-density lipoproteins (LDL, plasma proteins that carry cholesterol and triglycerides) without adequate removal of fats and cholesterol from the macrophages by functional high-density lipoproteins (HDL) (see apoA-1 Milano). It is commonly referred to as a hardening or furring of the arteries. It is caused by the formation of multiple plaques within the arteries

7.13 Alzheimer's disease

Alzheimer's disease (AD), also known in medical literature as Alzheimer disease, is the most common form of dementia. There is no cure for the disease, which worsens as it progresses, and eventually leads to death. It was first described by German psychiatrist and neuropathologist Alois Alzheimer in 1906 and was named after him. Most often, AD is diagnosed in people over 65 years of age, although the less-prevalent early-onset Alzheimer's can occur much earlier. In 2006, there were 26.6 million sufferers worldwide. Alzheimer's is predicted to affect 1 in 85 people globally by 2050.

Although Alzheimer's disease develops differently for every individual, there are many common symptoms. Early symptoms are often mistakenly thought to be 'age-related' concerns, or manifestations of stress. In the early stages, the most common symptom is difficulty in remembering recent events. When AD is suspected, the diagnosis is usually

confirmed with tests that evaluate behaviour and thinking abilities, often followed by a brain scan if available, however, examination of brain tissue is required for a definitive diagnosis. As the disease advances, symptoms can include confusion, irritability, aggression, mood swings, trouble with language, and long-term memory loss. As the sufferer declines they often withdraw from family and society. Gradually, bodily functions are lost, ultimately leading to death. Since the disease is different for each individual, predicting how it will affect the person is difficult. AD develops for an unknown and variable amount of time before becoming fully apparent, and it can progress undiagnosed for years. On average, the life expectancy following diagnosis is approximately seven years. Fewer than three percent of individuals live more than fourteen years after diagnosis.

The cause and progression of Alzheimer's disease are not well understood. Research indicates that the disease is associated with plaques and tangles in the brain. Current treatments only help with the symptoms of the disease. There are no available treatments that stop or reverse the progression of the disease. As of 2012, more than 1,000 clinical trials have been or are being conducted to test various compounds in AD. Mental stimulation, exercise, and a balanced diet have been suggested as ways to delay cognitive symptoms (though not brain pathology) in healthy older individuals, but there is no conclusive evidence supporting an effect.

8.0 Principles and goals of drug therapy in the elderly

Older patients have a higher prevalence of chronic and multiple illness, and physiological changes associated with ageing may masquerade as illness. They are thus more likely to be prescribed medication by their doctors and to take multiple agents. This puts them at a higher risk of suffering adverse drug reactions (ADRs), adverse drug events and drug-drug interactions. Pharmacokinetics and pharmacodynamics may be altered by normal ageing or disease, further heightening the risk of ADRs. It is also worth remembering that patients aged >65–70 years are rarely enrolled in clinical trials and thus the applicability of evidence derived from studies in younger patients cannot necessarily be assumed. Various strategies have recently been developed to identify older patients at risk from

adverse effects and to reduce the risk of initiating drugs likely to cause adverse events - e.g. Screening Tool of Older Persons Prescriptions (STOPP) and Screening Tool to Alert doctors to Right Treatment (START). STOPP is comprised of 65 clinically significant criteria for potentially inappropriate prescribing in older people. Each criterion is accompanied by a concise explanation as to why the prescribing practice is potentially inappropriate. START consists of 22 evidence-based prescribing indicators for commonly encountered diseases in older people. The responsibility for avoiding adverse drug reactions does not rest entirely with primary care. A Swedish study showed a significant drop in such events when geriatric patients due to be discharged from hospital were handed a formal Medication Report. This is a structured and detailed list of the patient's medication changes during the hospital stay and is part of the information that is given at discharge to the patient, the GP and the community nurse.

A thorough knowledge of the pharmacokinetic and pharmacodynamic factors is essential for optimal drug therapy in the elderly. In addition, some general principles based on common sense, if followed, may result in even better use of drugs in geriatric patients. These principles include:

Drug history:

A drug history should be obtained in all geriatric patients. This will ensure that the patient is not prescribed a drug or drugs to which they may be allergic or the same drug or drugs to which they have previously not responded. It will help to avoid potentially serious drug interactions.

Concomitant medical illness:

Concurrent medical disorders must always be taken into account.

Choosing the drug:

It is important to choose the drug likely to be the most efficacious and least likely to produce adverse effects. It is also necessary to take into consideration co-existing medical conditions.

Dose titration:

In general, elderly patients require relatively smaller doses of all drugs compared with young adults. It is recognized that the majority of adverse drug reactions in the elderly are dose related and potentially preventable. It is therefore rational to start with the smaller possible dose of a given drug in the least number of doses and then gradually increases both. (Walker & Whittlesea, 2007)

Choosing the right dosage form:

Most elderly patients find it easier to swallow syrups or suspensions effervescent tablets rather than large tablets and capsule.

Packaging and labeling:

Many arthritis patients find it difficult to open child resistant containers and blisters packs.

Good record keeping:

Information about a patients current and previous drug therapy, alcohol consumption, smoking, and habits may help in choosing appropriate drug therapy.

Regular supervision and review of treatment:

A UK survey showed that 59% of prescriptions to the elderly had been given for more than 2 years, 32% for more than 5 years, 16% for more than 10 years.

Adverse drug reactions:

The geriatric patients are more susceptible to ADRs for a number of reasons. They are usually on multiple drugs, which in itself can account for the increased incidence of ADRs.

Adherence:

Although it is commonly believed that the elderly are poor compliers with their drug therapy. Poor adherence may result in treatment failure. The degree of adherence required varies depending on the disease being treated. The degree of adherence required varies depending on the disease being treated. For treatment of a single urinary tract infection, a single dose of antibiotic may be all that is required and therefore compliance is not important. On the other hand, adherence of 90% or more is required for successful treatment of epilepsy or difficult hypertension. (Walker & Whittlesea, 2007)

Avoid unnecessary drug therapy:

Before commencing drug therapy it is important to ask the following questions.

Is it really necessary?

Is there an alternative method of treatment?

In patients with mild hypertension, for example, it may be perfectly justified to try non-drug therapies which are of proven efficacy.

Effect of treatment on quality of life:

The aim of treatment in elderly patients is not just to prolong life but also to improve the quality of life. To achieve this, the correct choice of treatment is essential.

Treat the cause rather than the symptom:

Symptomatic treatment without specific diagnosis is not only bad practice but can also be potentially dangerous. When a patient presents with a symptom every attempt should be made to establish the cause of the symptom and specific treatment.

9.0 Comprehensive Geriatric Assessment:

The geriatric assessment is a multidimensional, multidisciplinary diagnostic instrument designed to collect data on the medical, psychosocial and functional capabilities and limitations of elderly patients. The geriatric assessment differs from a standard medical evaluation in three general ways: (1) it focuses on elderly individuals with complex

problems, (2) it emphasizes functional status and quality of life, and (3) it frequently takes advantage of an interdisciplinary team of providers. These challenges, often referred to as the "Five I's of Geriatrics", include:

- intellectual impairment,
- immobility,
- instability,
- incontinence and
- iatrogenic disorders.

The geriatric assessment effectively addresses these and many other areas of geriatric care that are crucial to the successful treatment and prevention of disease and disability in older people. Performing a comprehensive assessment is an ambitious undertaking. Below is a list of the areas geriatric providers may choose to assess:

- Current symptoms and illnesses and their functional impact.
- Current medications, their indications and effects.
- Relevant past illnesses.
- Recent and impending life changes.
- Objective measure of overall personal and social functionality.
- Current and future living environment and its appropriateness to function and Prognosis.
- Family situation and availability.
- Current caregiver network including its deficiencies and potential.
- Objective measure of cognitive status.
- Objective assessment of mobility and balance.
- Rehabilitative status and prognosis if ill or disabled.
- Current emotional health and substance abuse.
- Nutritional status and needs.
- Disease risk factors, screening status, and health promotion activities.
- Services required and received.

Table 3.0: Diverse Goals and Objectives of “Assessment” in Geriatrics: (Wieland & Hirth 2003)

Clinical Goals:

- Multidimensional geriatric screening of relatively unselected older populations

To refer those at risk for CGA or other more thorough workup.

- Comprehensive geriatric assessment

To improve process of care:

- Improve diagnostic accuracy
- Improve medical treatment
- Arrange for long-term case management

To improve outcomes of care:

- Improve functional status
- Better quality of life

To contain costs of care:

- Reduce use of unnecessary formal services
- Prolong tenure in the home/community

Nonclinical Goals:

- Determine eligibility/payment for services
- Conduct research to determine patient baseline characteristics, natural history, or outcomes of treatment

10.0 Side-effects of specific drug classes for geriatric patients

10.1 Diuretics

- This class of drugs is often overused in the elderly and should not be used for chronic treatment of gravitational edema where measures such as leg-raising, increased walking/leg exercises and graduated compression stockings are often sufficient.
- Where diuretics are used to treat hypertension or cardiac failure, they should be reviewed regularly, along with an assessment of the patient's state of hydration and U and Es if necessary.
- Withdrawal of diuretics requires careful monitoring and consideration of potential contraindications to withdrawal, and can be difficult to achieve. For example,, patients with well-controlled heart failure can develop troublesome symptoms, and blood pressure can rise significantly in hypertensive patients.

10.2 5 Anticoagulants and anti-platelet drugs

- Beware of GI bleeding and contraindications such as peptic ulceration which may have occurred a long time ago and been forgotten about.
- For warfarin, prescribe only when patients have a full understanding of why the drug is being taken, its dangers, correct daily dosing/timing and the importance of regular INR monitoring.

10.3 Diabetic medication

- Long-acting oral hypoglycaemics such as chlorpropamide and glibenclamide should be avoided as there is a significant risk of hypoglycaemia when these agents are used in the older patient.
- Tight diabetic control must be balanced against potentially catastrophic events precipitated by hypoglycaemia, particularly in those who live alone, have a poor understanding of diabetes self-management, or who experience few warning symptoms of hypoglycaemia.

Table 4.0: Inappropriate medications according to explicit criteria: (Stuck & Beers, 1994).

Drug Category:	Inappropriate Medication:
Sedative or hypnotic agents	Long acting benzodiazepines such as diazepam chordiazepoxide and flurazepam Meprobamate Short-duration barbiturates
Antidepressant agents	Amitriptyline combination of anti depressant/
Antihypertensive agents	Antipsychotic
Non-steroidal anti-inflammatory drugs	Reserpine
Analgesic agents	
Oral hypoglycemic agents	Indomethacine, phenylbutazone
Dementia treatments	
Platelet inhibitor	Chlorpropamide
Muscle relaxant	
Gastrointestinal antispasmodic agent	Cyclandelate, Isoxsuprine Dipyridamole
Antiemetic agent	Carisprodol, cyclobenzapine, methocarbamol & orphenidrate

	Belladonna, hyoscyamine, clidinium
	Trimethobenzamide

Table 5.0: Common Drug-Disease interactions in geriatrics. (Farho L, 2007)

Combination:	Risk:
NSAIDs + CHF	Fluid retention; CHF exacerbation
Thiazolidinediones + CHF	
BPH + anticholinergics	Urinary retention
CCB + constipation	
Narcotics + constipation	Exacerbation of constipation
Anticholinergics + constipation	
Metformin + CHF	
NSAIDs + gastropathy	
NSAIDs + HTN	Hypoxia; increased risk of lactic acidosis
	Increased ulcer and bleeding risk
	Fluid retention; decreased effectiveness of diuretics

10.4 Antidepressants

- Tricyclic antidepressants commonly cause postural hypotension and confusion in the older patient; they should be used carefully.

Serotonergic medications used for depression may cause serotonin syndrome and agitation in the older patient; this can be difficult to distinguish from some of the symptoms of depression.

10.5 Digoxin

In the very elderly, the daily maintenance dose should 125µg. In the renally impaired, the dose should be 62.5µg. 250µg/day is likely to cause toxicity.

Drugs that cause bone marrow suppression.

Drugs such as co-trimoxazole and chloramphenicol should only be used if there is no suitable alternative.

10.6 Hypnotics

- Hypnotics with long half-lives are a significant problem and can cause daytime drowsiness, unsteadiness from impaired balance, and confusion.
- Short-acting ones may also be a problem and should only be used for short periods if essential.
- In patients prone to falls or dizziness avoid using these agents unless absolutely necessary.
- Where benzodiazepines are used to help patients overcome a crisis or transitional period, great care must be taken that they are given only for short periods, to avoid the danger of dependence and addiction.
- It is much better to take a good history of an older patient's sleep habits and suggest sleep hygiene and non-pharmaceutical measures to overcome insomnia, than to prescribe drugs, which at best will be a temporary solution.

10.7 NSAIDs

- Gastro-intestinal (GI) bleeding is more common and has more serious consequences in older patients.
- NSAIDs can worsen heart failure or aggravate impaired renal function. These effects can be worse in elderly patients.

- They are best avoided, if possible, for simple pain relief in osteo-arthritis (OA) etc; paracetamol should be tried instead and if this is insufficient try a low-dose NSAID in addition, with proton-pump inhibitor (PPI) or misoprostol cover, or substitute a low-dose opioid.
- Consider complementary therapies such as acupuncture to help with pain management.

The co-prescription of NSAIDs and ACE inhibitors in older patients can be a recipe for disaster; their combined deleterious effect on renal cortical perfusion and function can lead to significant renal impairment in the older patient.

11.0 Polypharmacy in Older Adults

The ingestion of four or more medications (including over the counter medications), specifically in an outpatient setting. For institutionalized and hospitalized patients this definition can include up to 10 medications. According to a report cited by the Department of Health and Human Services (1998), as many as 30% of older adults are taking 8 or more medications 80% of older adults ingest an average of 3 prescription medications on a daily basis 45% of older adults are taking at least one non-prescription medication on a daily basis 86% of medications taken by older adults are for a long-term health condition

11.1 Subgroups of Polypharmacy

There are three subgroups of Polypharmacy:

1. Appropriate polypharmacy: Appropriate multi-drug treatment
2. Inappropriate polypharmacy: Ingesting more drugs than necessary
3. Pseudopolypharmacy: Medication recording errors in facilities that falsely suggest polypharmacy is occurring.

Polypharmacy has the potential to lead to drug misuse and abuse as well as many of the same side effects associated with Benzodiazepine misuse.

12.0 Components of the Geriatric Assessment

The geriatric assessment incorporates all aspects of a conventional medical history including demographic data, chief complaint, present illness, past and current medical problems, family and social history, and review of systems. There are several features of the geriatric history, however, that require special attention given the nature of this population.

12.1 Nutrition

Diet is covered under Past Medical History in your H&P. However, due to its considerable importance in the geriatric assessment, we grant it here a separate section. Compared to the general population, the elderly are more vulnerable to inadequate nutrition for a number of reasons. These predominantly include (1) limited dentition or ill-fitting dentures, (2) diminished appetite due to loneliness, depression or appetite-suppressing drugs, (3) prevalent medical conditions including constipation, congestive heart failure, cancer and dementia, (4) lack of financial resources, and (5) non-compensated disabilities resulting in limited access to food and/or inability to prepare meals.

12.2 Social History

The social evaluation covers a vast area of information ranging from a patient's level of education to their views on terminal care. In fact, the terrain is so vast and complex that epidemiologists and clinicians alike have yet to fully embrace its tremendous impact on health.

12.3 Activities of Daily Living

When a patient is admitted to the hospital or other facility such as a nursing home, the staff will want to know immediately how much assistance the patient will need for their Activities of Daily Living . The ADLs are self-care activities that people must

accomplish to survive independently. They include bathing, dressing, toileting, transferring, continence and feeding. The sequence is not arbitrary; patients generally lose these skills in that order and they are regained in the reverse order during rehabilitation.

12.4 Problem List

As practitioners collect assessment data, they need to record it in such a way that all members of the team can quickly and confidently access the information. Traditionally, practitioners generate a problem list for this purpose. The entries include any disease, syndrome, or event requiring new or ongoing attention by anyone caring for the patient. Unlike most conventional problem lists, the geriatric assessment list needs to include (1) the medical, nutritional, functional and social implications, and (2) proposed intervention targets

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12.6 Instrumental Activities of Daily Living

When a discharge home is anticipated, it becomes important to determine how the patient functions in terms of their Instrumental Activities of Daily Living. IADLs are those higher-level activities people must perform in order to remain independent in a house or apartment.

12.7 Functional Examination

Health is considerably more than absence of active disease. The functional assessment has become an indispensable part of the geriatric assessment, for a number of reasons: (1) As patients live longer with chronic incurable conditions, they survive longer periods with functional impairments that require some sort of medical and social response. (2) Our society places great emphasis on autonomy and independence, both of which are directly threatened by functional disability. (3) In the geriatric patient, the first sign of a medical problem is commonly manifest as a change in functional status. (4) From a cost-of-care standpoint, effective medical management is that which takes into account total function rather than revolving around crisis management of recurrent, acute symptoms.

12.8 General Appearance

One of the most important and useful parts of the exam is your overall impression of the patient's state of health by observation.

12.9 Family History

Individuals who are genetically predisposed to a disease tend to manifest it prematurely, that is, before the general population. Therefore, most diseases that go undiagnosed until late in life, probably result more from an accumulation of environmental stressors than from the predisposing effects of genotype. This makes an elder's family less relevant to the geriatric assessment than other potential determinants of health. Nevertheless, the family history still provides useful information about familial predisposition to diseases that are virtually always late in onset, most notably osteoporosis and Alzheimer's disease.

12.10 Review of Systems

Any thorough clinical evaluation includes a complete review of systems (ROS). The geriatric assessment's ROS emphasizes questions specifically pertaining to the functional capabilities of elders.

12.11 Substance Abuse

Like adolescent or adult populations, the elderly are at risk for substance abuse. However, unlike younger people who use a wide range of drugs including hallucinogens, stimulants and opioids, addictions in older individuals are largely restricted to sedative-hypnotics and alcohol. Due to their high prevalence of sleep disturbances, hypnotics like benzodiazepines are frequently prescribed (often inappropriately) to older patients, sometimes resulting in abuse. Including an alcohol screen in the geriatric assessment is important. Unlike their younger counterparts who are more likely to come to the attention of employers, police, and family members, older alcoholics usually come to the attention of the medical system first, often with subtle or confusing symptoms. A number of factors place elderly patients at increased risk for alcoholic complications. They include (1) a decrease in lean body mass, (2) diminished efficiency of hepatic metabolism, (3) an increase in brain sensitivity to alcohol, (4) a high prevalence of medical and psychosocial comorbidities, and (5) a high incidence of alcohol-drug interactions due to polypharmacy.

12.12 Physical Examination

Although a complete physical examination is an essential part of the geriatric assessment, our intention here is to highlight those areas that are of particular relevance to the elderly patient.

12.13 16 General Appearance

One of the most important and useful parts of the exam is your overall impression of the patient's state of health by observation.

12.14 Demographic Data

Clinical medicine, largely a scientific endeavor, relies heavily on the acquisition of objective information. Although virtually all historical data is subjective to one degree or another, clinicians must ultimately base their medical decision on accurate information.

12.14 Chief Complaint and Present Illness

Elderly patients are famous for presenting with any combination of non-specific, apparently unrelated and seemingly trivial complaints. Sometimes they have no complaint at all. Unlike many younger patients, it is the rare elder who walks in and hands her physician a discrete and easily recognizable diagnosis. This is for several reasons. First, many older patients interpret their pain or dysfunction as "normal" signs of aging. Second, in geriatrics, multiple problems are the rule. In some ways, systems-based medicine is poorly adapted to care for the elderly given their penchant for multisystem disorders. And third, insurmountable communication barriers may prevent elderly patients from receiving effective medical attention. Cultural incompatibilities, memory loss, depression, and hearing impairment may all contribute to the collection of an inadequate, or even unintelligible, description of the chief complaint and present illness.

12.15 Past Medical History

This section of the geriatric assessment is similar to the information obtained from other patient populations. The only difference is that the data are more extensive, generated by more providers, and the source is potentially more distant.

12.16 Vocation and Education

It is important to remember that raising a family, looking for a job, going to school and enjoying retirement are all legitimate "vocations". Many older adults who have retired from their "careers" continue to work part time or volunteer. The potential benefits of

working include community connections, financial independence, personal accomplishment and self-respect, all of which are potential determinants of health.

12.17 Habits

Decades of research have firmly established the link between an individual's lifestyle and his health

12.18 Exercise

The numerous and beneficial health effects of regular exercise in the elderly operate in both the short and long-term. Exercise decreases blood pressure, weight, cardiovascular and cerebrovascular risk, osteoarthritic joint pain and stiffness, osteoporosis and overall mortality. It improves glucose tolerance, strength, cardiopulmonary fitness, agility and flexibility, balance, sleep, mood and cognition. It is hard to come up with a compelling argument against some form of exercise, even in the frailest elderly.

12.19 Sleep

Sleep physiology changes dramatically with age. Older adults tend to sleep fewer hours and often find it difficult to fall asleep (sleep latency) or stay asleep. A poor night sleep may have a range of health effects including mood disorders, cognitive impairment and even immunologic dysfunction.

12.20 Sexual Activity

Elders have sex. Although pregnancy is not an issue, sexually transmitted diseases are not irrelevant to geriatrics, and physicians often make incorrect assumptions regarding monogamy and safe sexual practices. Although a minority of elderly patients may be at risk from sexual indiscretion, most are far more concerned about the opposite problem, sexual dysfunction.

12.21 Substance Use

Although the prevalence of illicit drug use in the geriatric population is relatively low, older adults do not lose interest in most other substances. It is extremely rare for anyone to take up smoking late in life, so the vast majority of elders who smoke have been doing so for decades. Similarly, elders who have no prior history of alcoholism, or other addictive behavior, do not suddenly develop a pattern of addictive behavior in their seventies and eighties. Elderly alcoholics almost always have a history of substance abuse or misuse, of one form or another, dating back to their youth.

13.0 Reasons of polypharmacy in Geriatric patients

Polypharmacy can be defined as the use of multiple medications for the treatment of a patient's medical conditions. The term polypharmacy suggests that more medication is being used than is clinically indicated. The number of medicines taken by a patient that constitutes polypharmacy has not been defined. There are several reasons for polypharmacy:

- 1) As the population ages, polypharmacy increases. The elderly often require multiple medications to treat multiple health-related conditions.
- 2) Patients with multiple co-morbid medical conditions also require numerous medications to treat each condition. It is not unreasonable for patients with multiple comorbid medical conditions to be on 6 to 9 medications to reduce his or her long term risk for those conditions, i.e, diabetes complications and coronary events.
- 3) A recent hospitalization also puts you at risk of polypharmacy. Medicines are started and stopped quite frequently during your hospital stay.
- 4) Multiple doctors are prescribing medications for the same patient. Once a patient starts a medication, it is never discontinued.
- 5) Doctor changes from one medicine to another within the same therapeutic class; but the patient doesn't stop taking the first medicine.
- 6) Doctors also may have a patient on a brand name drug and write the next prescription for a generic drug.
- 7) In an effort to cut costs, patients fill prescriptions at several pharmacies. Once you choose the most cost-effective pharmacy, stick to one pharmacy. One pharmacy would

have a complete list of all your medicines to better inform you of duplications, interactions, etc.

8) Lack of patient education is the most common reason. Doctors don't inform patients or patients do not ask questions.

Polypharmacy itself is not problematic. Consider, for instance, a patient with type 2 diabetes and existing coronary heart disease who has received a recent coronary stent for myocardial infarction. It is not unreasonable or uncommon for this patient to be on 6 to 9 medications to reduce his or her long term risk for diabetes complications and secondary coronary events. In fact, strict adherence to national treatment guidelines for this patient will result in a minimum of 6 concurrent prescription therapies. Polypharmacy can, however, become problematic when negative outcomes occur. Polypharmacy has been shown to result in:

- 1) Unnecessary and/or inappropriate medication prescribing
- 2) Increased risk for drug interactions and adverse drug reactions
- 3) Nonadherence
- 4) Increased overall drug expenditures.

The prescribing of inappropriate medication often results in polypharmacy.

14.0 Treatment

1. Reconcile medications upon discharge from hospital or skilled nursing facility:

As mentioned above, a risk factor for polypharmacy includes recent hospitalization. The transfer of a patient from a hospital to his or her home is associated with adverse events and negative outcomes, most of which are related to changes in the patient's drug therapy during treatment in these facilities. Evaluating a patient's medication regimen and educating a patient upon discharge from a facility is likely to reduce duplicate therapy, inappropriate prescribing, and reduce unnecessary medication. JCAHO has recognized this and made medication reconciliation a 2005 National Patient Safety Goal for all accredited hospitals.

2. Initiate interventions to ensure adherence:

Using combination products (i.e., lisinopril/hydrochlorothiazide combination pill) will reduce overall pill number and potentially improve adherence. Other strategies include using generic options to reduce cost and using adherence aids such as pillboxes.

3. Prevention:

The appropriateness of the medication for the patient and the potential for side effects must be considered. As the old adage goes, “an ounce of prevention is worth a pound of cure”. Any drug that is unnecessary, inappropriate, or has a high likelihood for causing side effects that would require additional therapy should be avoided.

4. Maintain an accurate medication and medical history:

Identify all medications, including any OTC therapies. Having a complete list of medications can deter a provider from adding on an additional therapy. Further, knowledge of a specific medication being used may explain a patient-specific symptom or complaint. For example, knowing a patient is on an opioid analgesic may explain why he or she has constipation. A complete history of the patient’s medical condition also is important. Identifying the patient’s medical history allows the pharmacist to identify inappropriately prescribed medications. For instance, metformin is not appropriate for patients with end-stage kidney disease.

5. Link each prescribed medication to a disease state:

Each medication should match a patient’s diagnosis. Any medication that does not match a diagnosis is potentially unnecessary, and an attempt to discontinue the medication should be made. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) is a not-for-profit (nongovernmental) organization. Its mission is to improve

the safety and quality of care provided to the public through the provision of health care accreditation and related services that support performance improvement in health care organizations.

6. Identify medications that are treating side effects:

The use of multiple medications leads to a higher risk of side effects. When side effects occur, additional medications can be initiated to treat the side effect. A common example includes the use of laxatives to treat the medication side effect of constipation

15.0 Role of pharmacist

The role of the pharmacist in the prevention and treatment of polypharmacy differs depending on the health care setting. Long-term care pharmacists routinely evaluate drug therapy regimens in predominantly elderly patients. They adhere to federal regulations with the goal of reducing negative outcomes associated with polypharmacy. Hospital pharmacists review the complete and accurate list of the patient's medications, evaluate this list for drug therapy problems that arise when medications are discontinued and initiated during hospitalization. Community pharmacists play a vital role in polypharmacy by preventing the dispensing of unnecessary, inappropriate, and side effect-prone medication.

16.0 Role of consumer

By being an informed consumer, you can help prevent polypharmacy. The following is a list of

steps to help you get started:

- 1) The most important thing you can do is get involved in your healthcare. Studies show that you have better outcomes when you are involved. Don't be afraid to ask questions.
- 2) Know the name and strength of the medications you take, their indications, side effects,

and drug interactions.

3) Buy generics whenever possible. When you start on a new medication, ask for samples. You may not be able to tolerate it and can change meds before you get a prescription filled.

4) Brown-bag it: take all your medicines including prescriptions, over-the-counter (otc) medicines and dietary/herbal supplements with you when you go to the doctor's office or hospital.

6) Ensure dietary/herbal supplements are safe before taking. Long term efficacy has not been determined. The majority of data concerning these products are derived from small trials with poor study design.

7) Store medicines in a cool, dry place; preferably someplace where you can remember to take

them (on the kitchen table if you take meds with meals or at the bedside if you take at bedtime). Be sure to keep these meds out of the reach of small children.

8) Ask your pharmacy for flip-top lids if you have a hard time opening the child-resistant lids.

9) If you can't remember if you've taken your meds, try a med dispenser. You can fill them

up weekly, and you know at the end of the day if you have taken them or not.

10) Expiration date: The date at which the manufacturer can no longer guarantee the full effect of the medication.

17.0 Standard Treatment Guidelines (STG)

1. Carry out a regular medication review and discuss and agree all changes with the patient

2. Stop any current drugs that are not indicated

3. Prescribe new drugs that have a clear indication

4. If possible, avoid drugs that have known deleterious effects in elderly patients, such as benzodiazepines, and recommend dosage reduction when appropriate

5. Use the recommended dosages for elderly patients

6. Use simple drug regimens and appropriate administration systems
7. Consider using once daily or once weekly formulations and using fixed dose combinations when possible
8. Consider non-pharmacological treatments if appropriate
9. Limit the number of people prescribing for each patient if possible
10. Where possible, avoid treating adverse drug reactions with further drugs. (Milton & Stephen, 2008)

18.0 Preferred STG for appropriate prescribing for Geriatric patients

1. Attempt nonpharmacological measures when feasible.
2. Before starting a new drug, consider the possibility that the patient's symptoms are related to an adverse drug reaction.
3. When prescribing a new drug, provide education about indications for use, instruction for taking the medication, common side effects, and potential serious adverse effects, as well as what to do when these side effects occur.
4. Regularly review all medications. Include OTCs, herbal products, and vitamin and mineral supplements. Encourage patients to maintain an active medication list.
5. Coordinate care with all providers to eliminate duplication of prescriptions.
6. Identify indications for each medication.
7. Regularly assess therapeutic responses to medication.
8. Discontinue drugs without a clear indication for use.
9. Discontinue drugs that have not achieved the therapeutic goal.
10. Avoid medications with high incidence of adverse Outcomes in the elderly (Beers list).
11. When possible, combine indications with a single drug.
12. Regularly assess patient compliance, especially before changing doses of a drug or adding a new drug.
13. Choose drugs with wide therapeutic windows when possible.
14. Check for potential drug interactions; use available software programs.
15. When considering pharmacotherapy for preventive purposes, consider the likelihood that a patient will benefit from treatment given his or her age and comorbidities.

19.0 Study Goal

Polypharmacy is the use of multiple medications by a patient, generally older adults (those aged over 65 years). More specifically, it is often defined as the use of five or more regular medications. It sometimes alternatively refers to purportedly excessive or unnecessary prescriptions. The term polypharmacy lacks a universally consistent definition. Polypharmacy is most common in the elderly, affecting about 40% of older adults living in their own homes. Every medication has potential adverse side-effects. With every drug added, there is an additive risk of side-effects. Also, many medications have potential interactions with other substances. As a new drug is prescribed, the risk of interactions increases exponentially. Doctors and pharmacists aim to avoid prescribing medications that interact; often, adjustments in the dose of medications need to be made to avoid interactions, such as with warfarin, as it may lose its effect.

The major goal of the study is to analyze the prescribing patterns of geriatric patients in both of the hospital and determine the commonest diseases affecting elderly in the study locations, most frequently prescribed pharmacological classes e.g. antibiotics, number of drug prescribed in generic name & duration of patient counseling.

The other objectives of the study was to identify and analyze the age group of the patients, sex, monthly family income, chief complaints, stress, behavioral condition of the Geriatric patients.

20.0 Type of study

It is a cross-sectional study of all prescriptions received from the geriatric patients with the help of preformed questionnaire. It was attempted to observe prescribing practice and polypharmacy of geriatric patients in selected hospitals. In addition to this, chief complaints of the patients, their diagnosis, their family status, most frequently prescribed pharmacological classes e.g. antibiotics, number of drug prescribed in generic name & duration of patient counseling. also observed.

21.0 Place of study

The study was conducted in Apollo Hospitals Dhaka and United Hospital Ltd. The Apollo Hospitals Dhaka is situated in Bashundhara R/A, Baridhara, Dhaka. It was established in 2005. This hospital is providing all modern facility to the patients. The hospital is composed of 200 beds, offering 24 hours of services. This hospital comprises of Outdoor, Emergency and highly specialized Knee care unit. A good number of permanent national and international Doctors and specialist doctor are providing cardiac medical and surgical care services to all categories of patients. In addition to this, United Hospital Ltd. is situated in Gulshan, Dhaka. This hospital is providing all modern facility to the patients. The hospital is composed of 200 beds, offering 24 hours of services. This hospital comprises of Outdoor, Emergency and highly specialized Cardiac & Oncology care unit. A good number of permanent national and international Doctors and specialist doctor are providing cardiac medical and surgical care services to all categories of patients.

22.0 Study population

Around 120 outdoor geriatric patients diagnosed by the hospital physicians.

23.0 Inclusion Criteria of the study

1. Patient of ages 60 or above 60 years.
2. Both sexes irrespective of religion and occupation.

24.0 Exclusion Criteria of the study

- i) Patients of other age groups other than geriatric patients.
- ii) Post operative, In-patient & Emergency admitted geriatric patients.

25.0 Research Approach:

After getting the approval of the research proposal from the honorable faculty members, formal permission was obtained from the competent authorities of Apollo Hospitals Dhaka and United Hospitals Ltd. . The data were collected from the outdoor patients.

26.0 Research Tools

The following equipments were used in this study,

- 1). Interview schedule of geriatric patients according to questionnaire.
- 2). Collection of prescription (If possible).

27.0 Data collection method

After explaining the purpose of the study to the respondents and obtaining their verbal consent, the researcher interviewed all the respondents by asking question in Bengali and using a thoroughly pre –tested questionnaires the questionnaires was be consists of 26 (twenty six) questions and if possible collected a Xerox copy of prescription prescribed by the physicians.

28.0 Study period

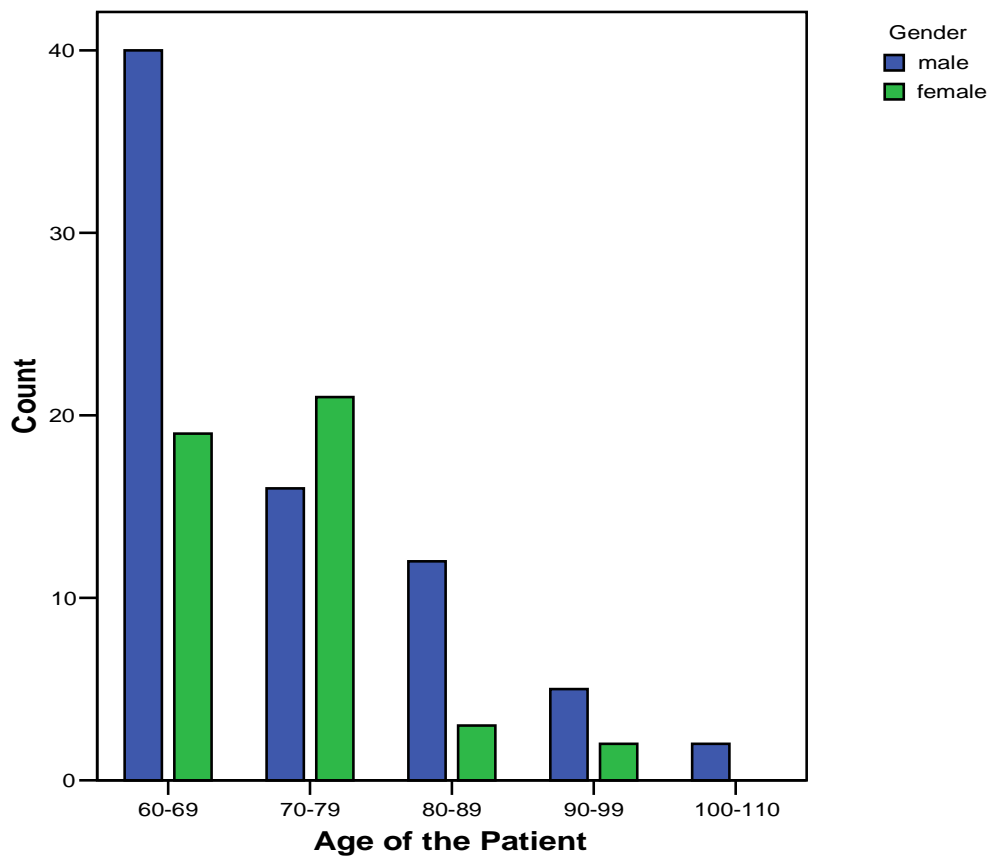
Study period will be one year commencing from JJanuary 2013 to October, 2013. To complete the study in time a work schedule is prepared depending on different task of the study .The four months were spent for literature review, selection of topic, development of the protocol. Subsequent months spent on official correspondence, data collection, data analysis, report writing and submission of report.

29.0 Data analysis

All the data were checked after collection. Then data was entered into computer, with the help of software Microsoft Office Excel 2007. The result was shown in bar, pie chart and calculate the percentage of polypharmacy and percentage of different parameter of geriatric patients.

29.1 Age Group of Geriatric Patients (Total n= 120):

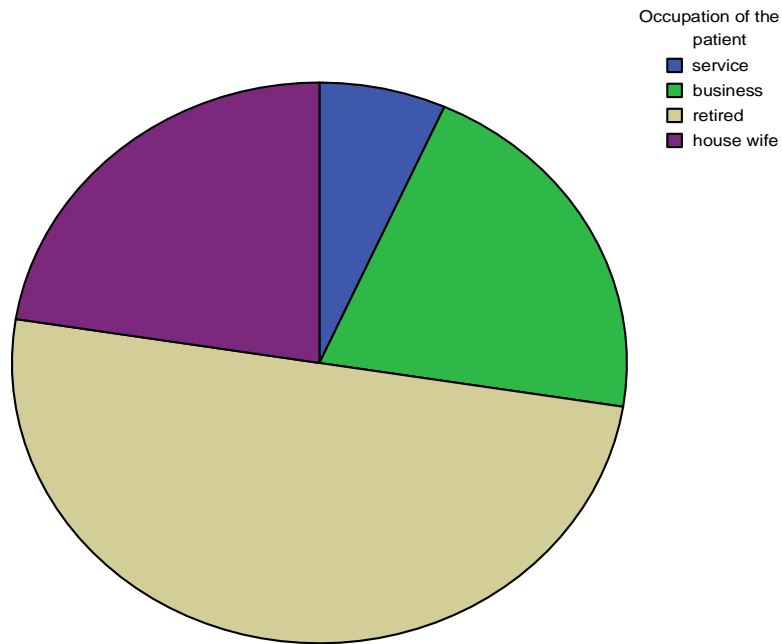
Fig. 2.0: Age group and corresponding number of male and female Geriatric patients.



The total 120 patients of above 60 years were examined. Among 120 patients 75 Male (62.5 %) and 45 Female (37.5). Among 120 patients only 1.66% patients are above 100 years of age. Maximum 49.16% of patients are within the range of 60 and 69. There are no female patients above 100 years of age.

29.2 Occupation of the patients (Total n=24):

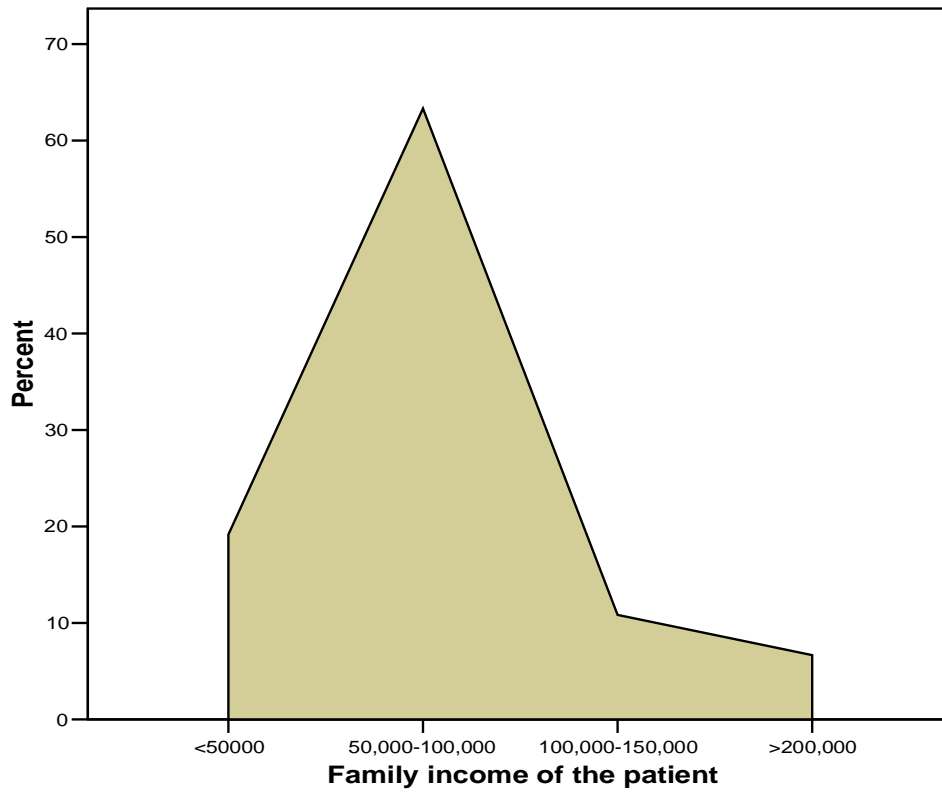
Fig. 3.0: Occupations of the geriatric patients .



Among these 120 patients 6.66% & of patients are Service holder, 20.83% are Business man, 50% are retired from the service & 22.5% patients are House Wife.

29.3 Family income of the patients

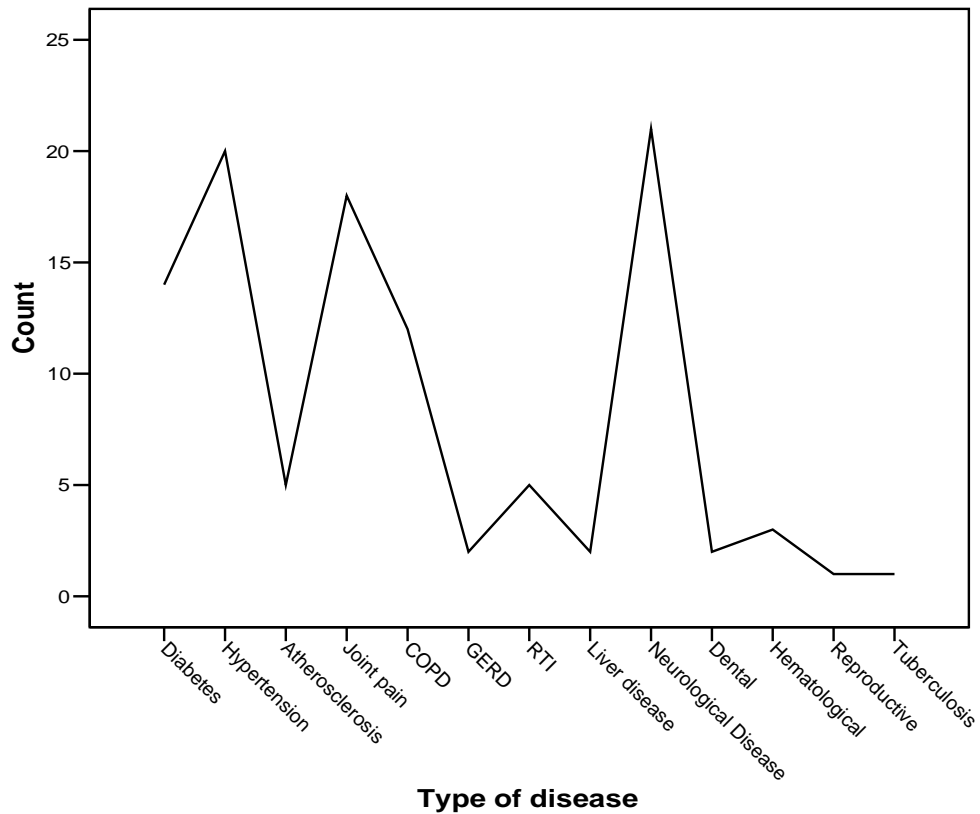
Fig. 4.0: Family income of the patients.



Here, monthly family income of 19.16% of patients are less than BDT. 50,00/= only, 63.33% of patients family monthly income is in between BDT 50,000-100,000, 10.83% of patients family earns BDT 100,000-150,000 per month, 6.66% of patients earn more than BDT 200,000 per month & none of patients found with a monthly family income of BDT 150,000-200,000.

29.4 Common Diseases of Geriatric patients:

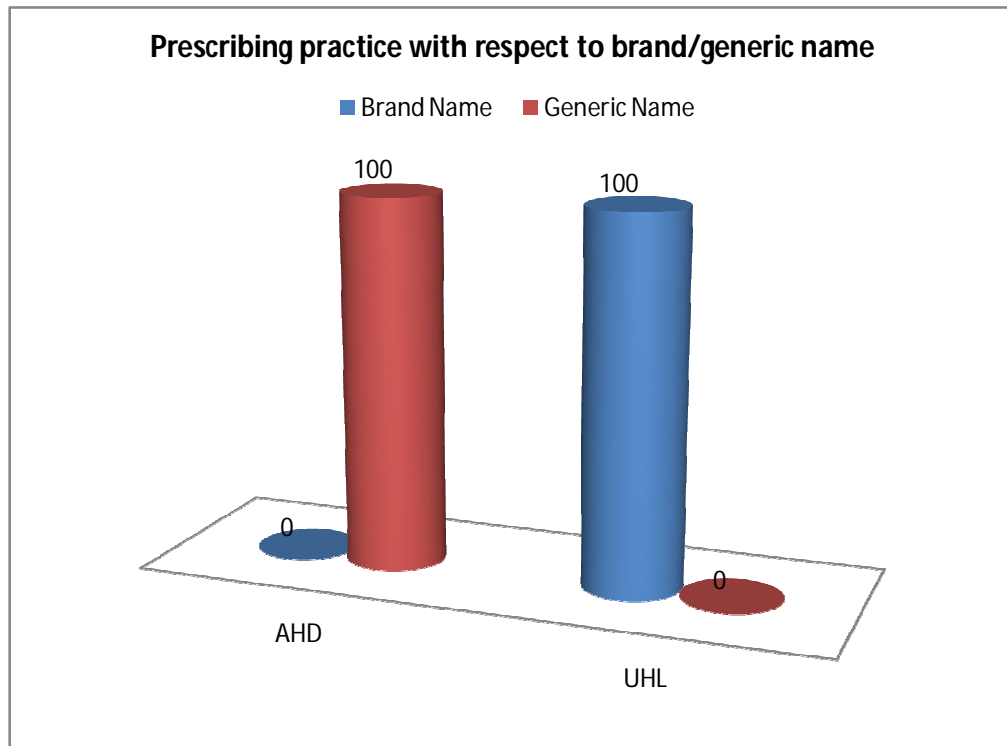
Fig. 5.0: no. of common diseases among Geriatric patients.



The most 17.5% of geriatric patients are suffered from Diabetes & Neurological Disorder. Both male and female are equally sufferer of Diabetes. The second most occurring disease is Hypertension. About 16.6% of geriatric patients are suffered from Hypertension. About 15.0% patients suffered from Joint pain. 10.83% of patients are suffering from COPD. Apart from these approximately 6.66% of patients are suffering from Atherosclerosis, 2.5% are suffering from Cardiac arrhythmia & Hematological problem, 1.66% of patients are suffering from GERD, Liver Disease & Dental Problem & only one person found who is suffering from Tuberculosis.

29.5 Prescribing Practice in AHD & UHL with respect to Generic name and Brand name:

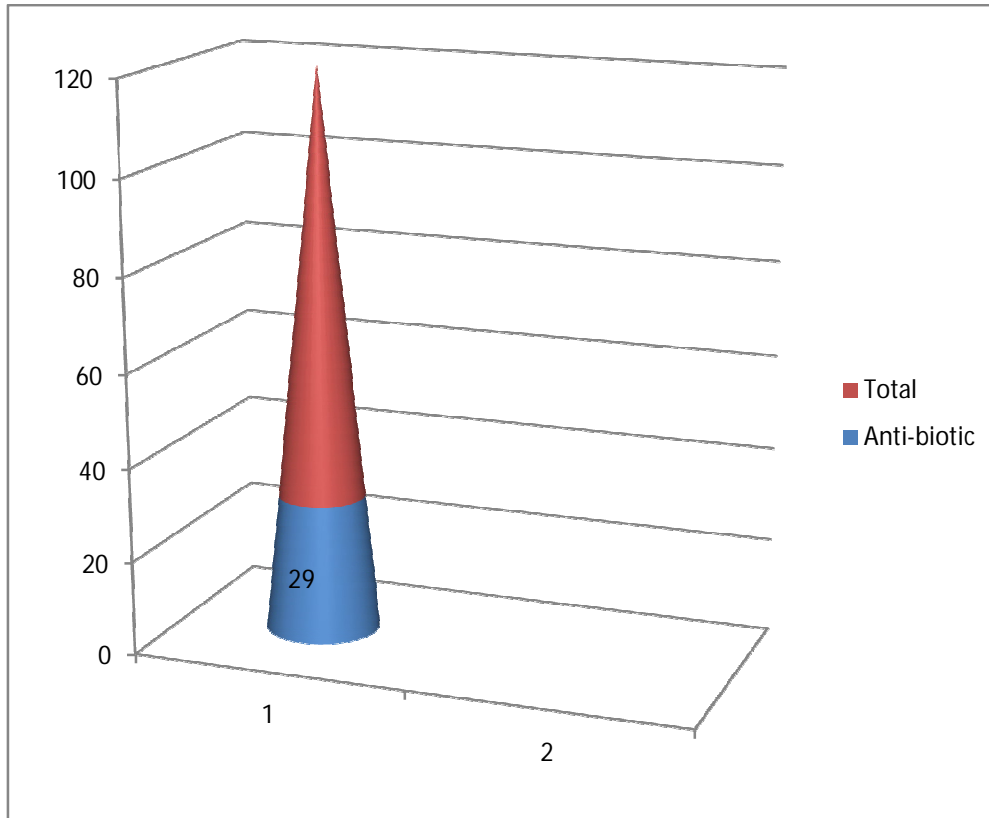
Fig. 6.0: Prescribing Practice of drug in AHD & UHL with respect to Generic name and Brand name



Among both of the Hospital, 100% of drug is prescribed in generic name at Apollo Hospitals Dhaka, on the other hand unlike the other hospitals in bangladesh 100% of drug is prescribed in Brand name at United Hospital Ltd.

29.6 Patients prescribed with anti-biotics:

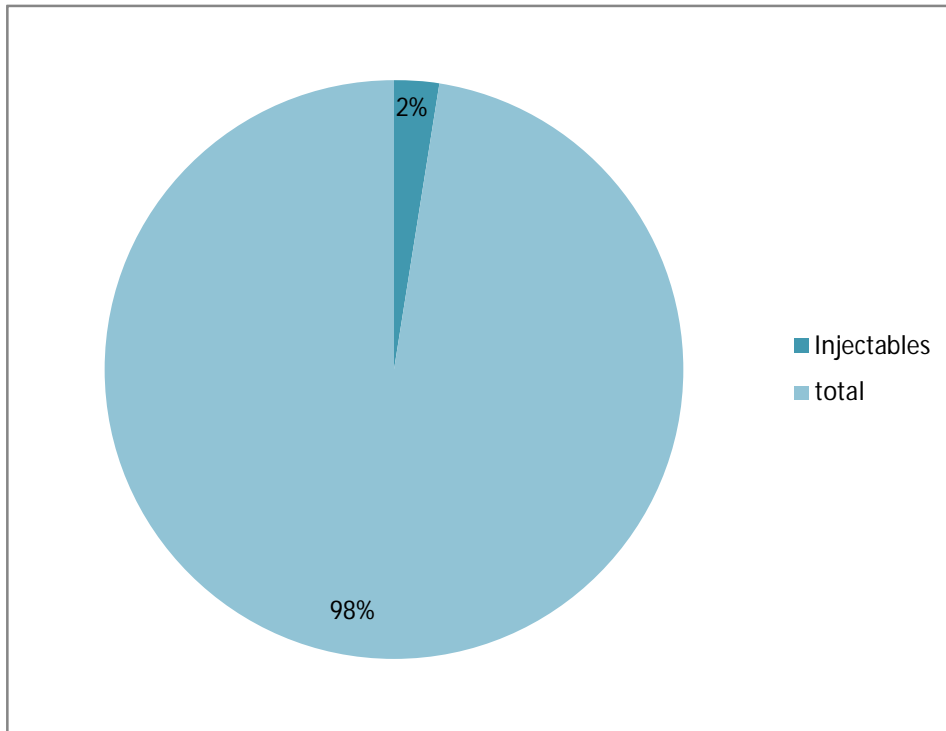
Fig. 7.0: No. of patients prescribed with anti-biotics.



29 patients or 24.16% of patients are prescribed with anti-biotics, most of them are prescribed with single anti-biotics

29.7 Patients prescribed with Injectables:

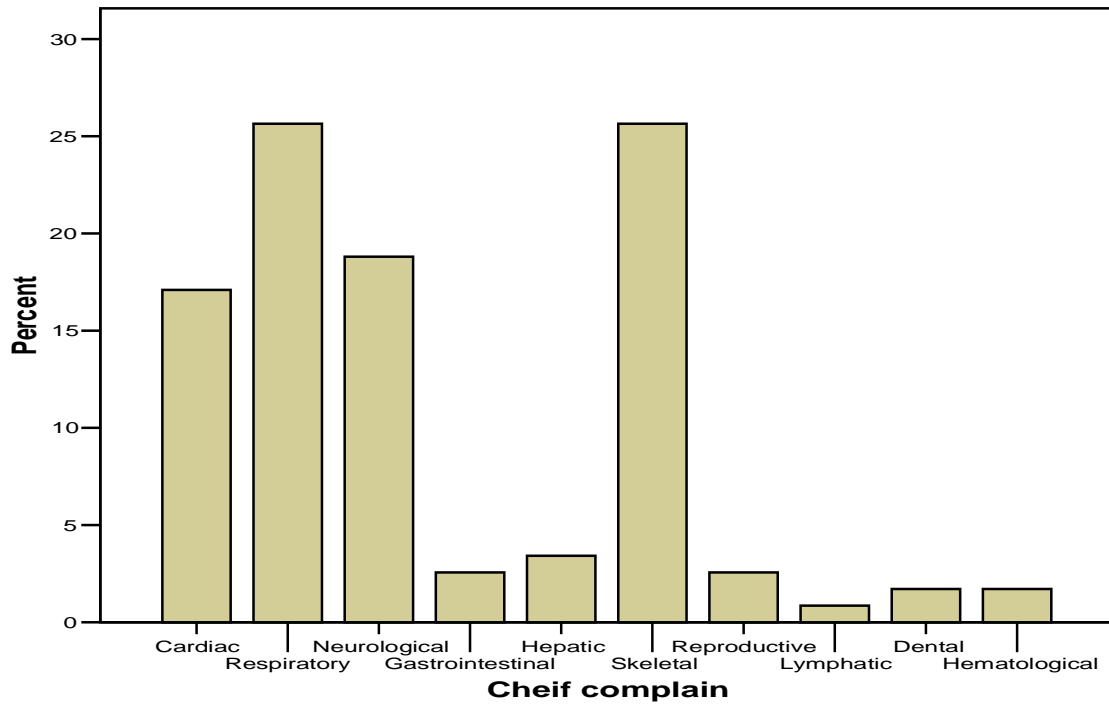
Fig. 8.0: No. of patients prescribed with Injectables.



03 patients or 2.0% of patients are prescribed with Injectables, most of them are prescribed with single injectables

29.8 Chief omplaints

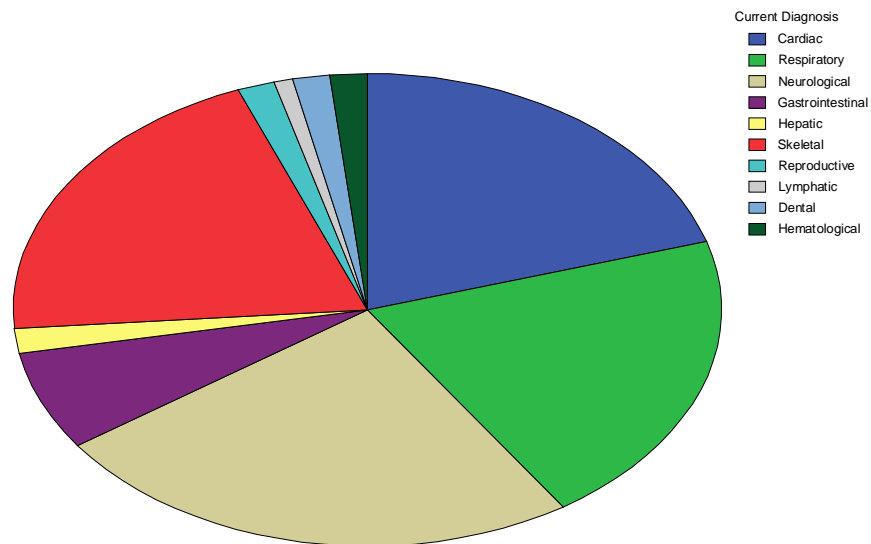
Fig. 9.0: Chief complain of the geriatric patients..



The most 26% of patients chief complains are respiratory & skeletal , 18.5% of geriatric patients have neurological complains, 17.0% of patients complains are associated with cardiac disorders & below %% of patients are complaining about gastrointestinal, hepatic, reproductive, lymphatic, hematological & dental Disorders. None of the target patients complained about renal, dermatological, muscular & endocrine disorders.

29.9 Current diagnosis of geriatric patients

Fig. 10.0: Current Diagnosis of the geriatric patients.



The most 25.0% of diagnosis neurological, 20.0% of patients are suffering from cardiac, respiratory & skeletal disorders. Approximately 9% of patients are diagnosed with gastrointestinal disorders & current diagnosis of less than 5% of target patients are Hepatic, reproductive, dental, lymphatic & hematological. None of the patients are diagnosed with renal, dermatological, muscular & endocrine disorders.

29.10 Different physical and behavioral pattern of geriatric patients:

Graphical presentation of different physical and behavioral pattern of geriatric patients are given bellow:

Table 6.0: Different physical and behavioral pattern of geriatric patients:

Characteristics:	% of patients maintain and suffered	% of patients do not suffer and maintain:
Visit doctor regularly	77	23
Following prescription	97.5	2.5
Stress in life	80	20
Physical exercise	461	54
Smoking Habit	63	37
Take betel leave	82	18
Take Multi-vitamin	67.5	32.5

Graphical presentation of different physical and behavioral pattern of geriatric patients are given bellow:

Fig. 11.0: Regular doctors visit.

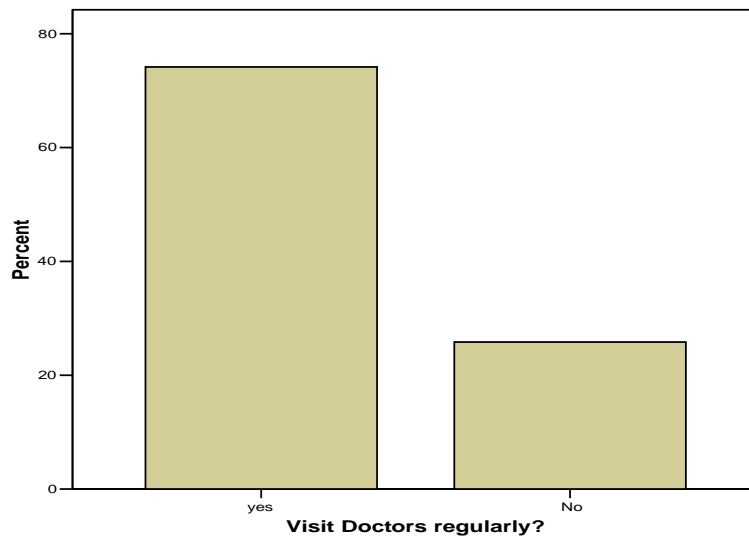


Fig. 12.0: Following prescription.

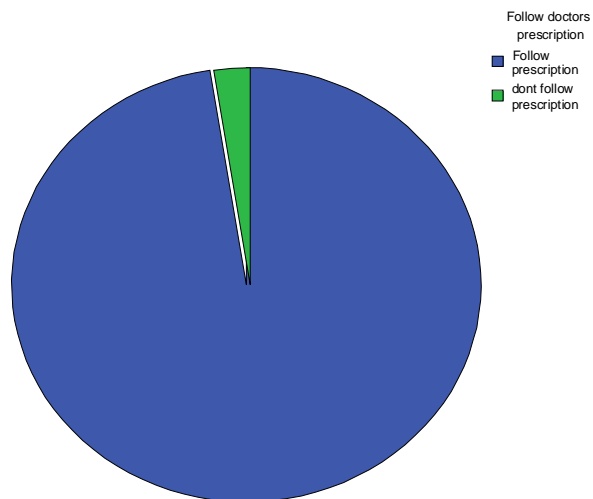


Fig. 13.0: Stress in life.

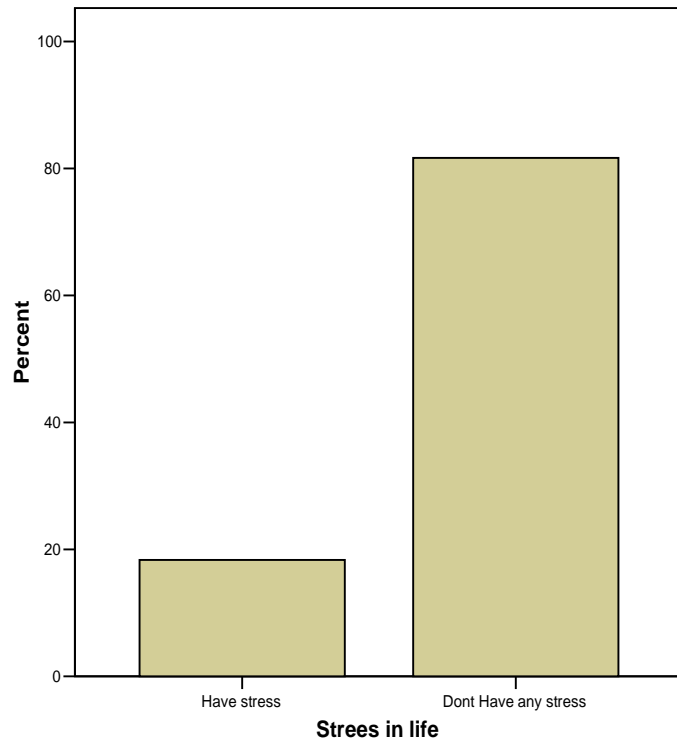


Fig. 14.0: Regular physical exercise.

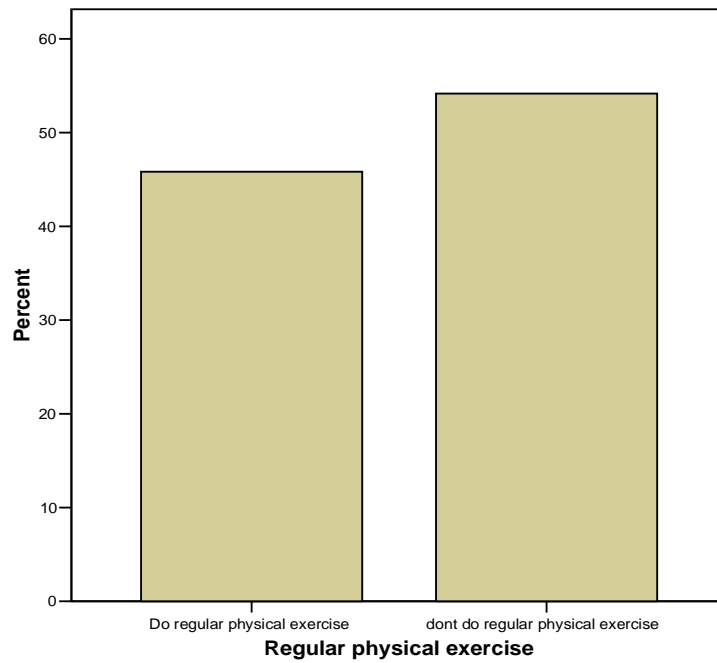


Fig. 15.0: Smoking habit

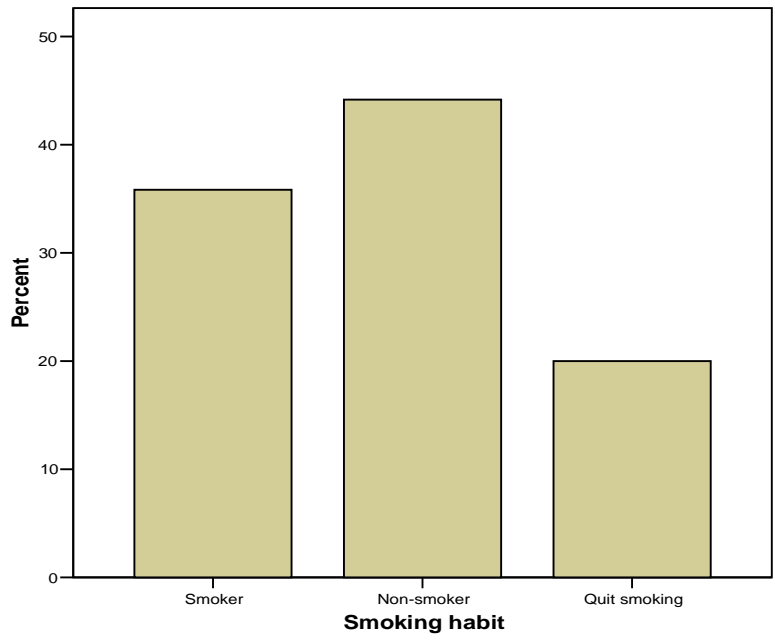


Fig. 16.0: Take betel leave

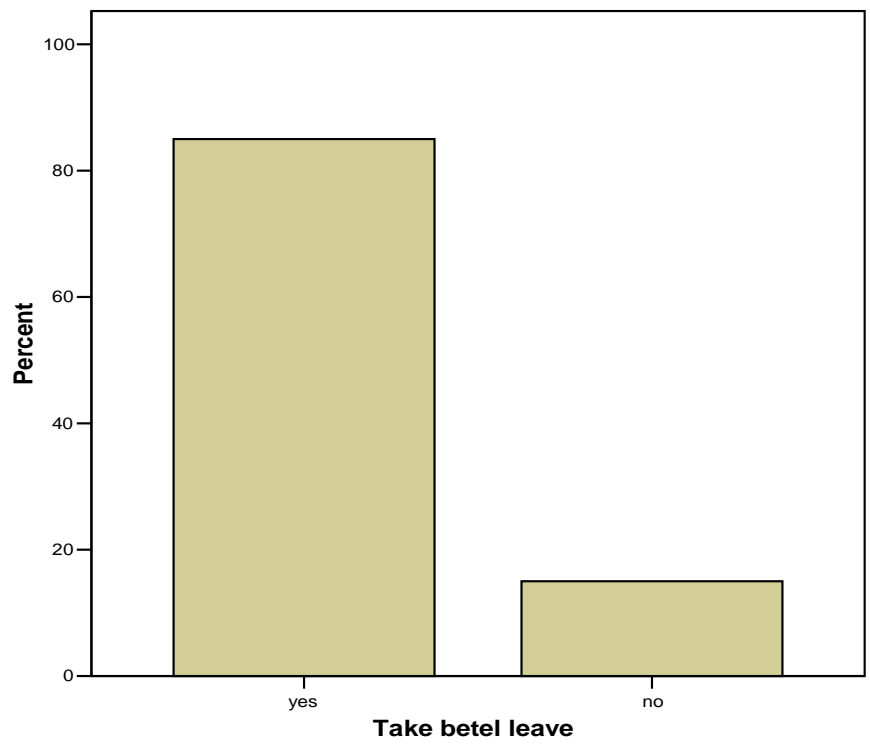


Fig. 17.0: Take Multi-vitamin.

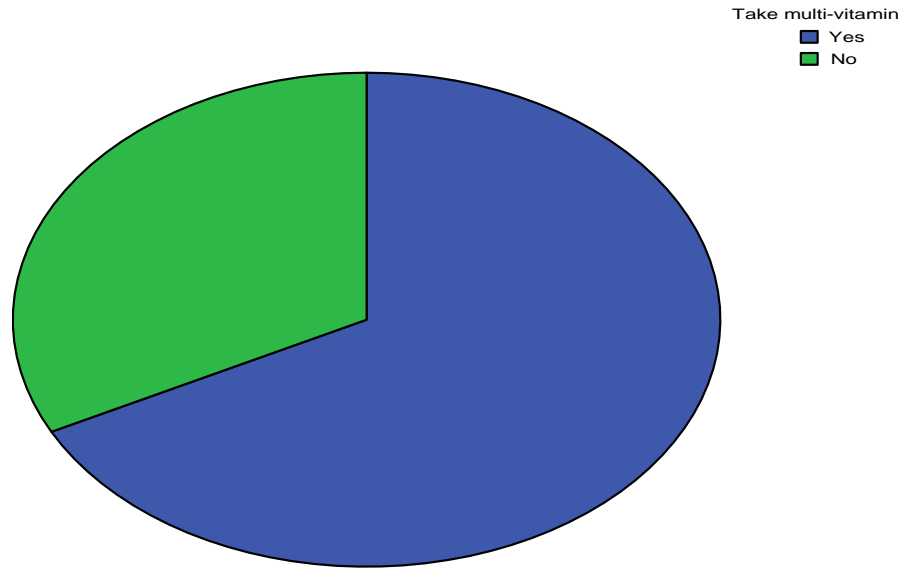
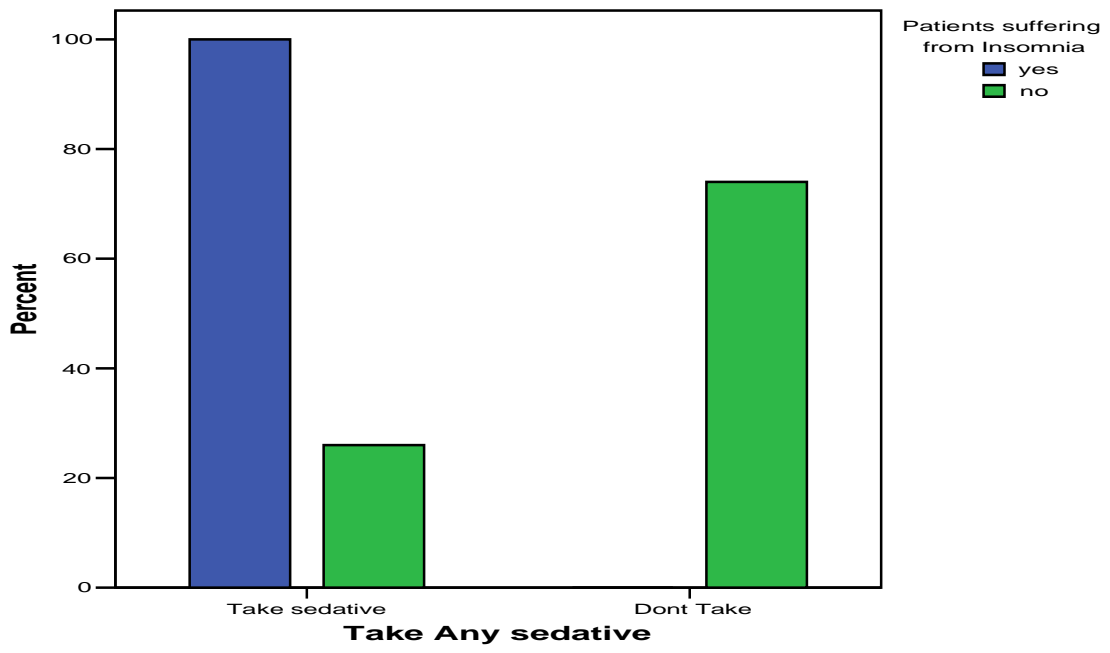


Table 7.0: Patients suffering from insomnia & take sedative

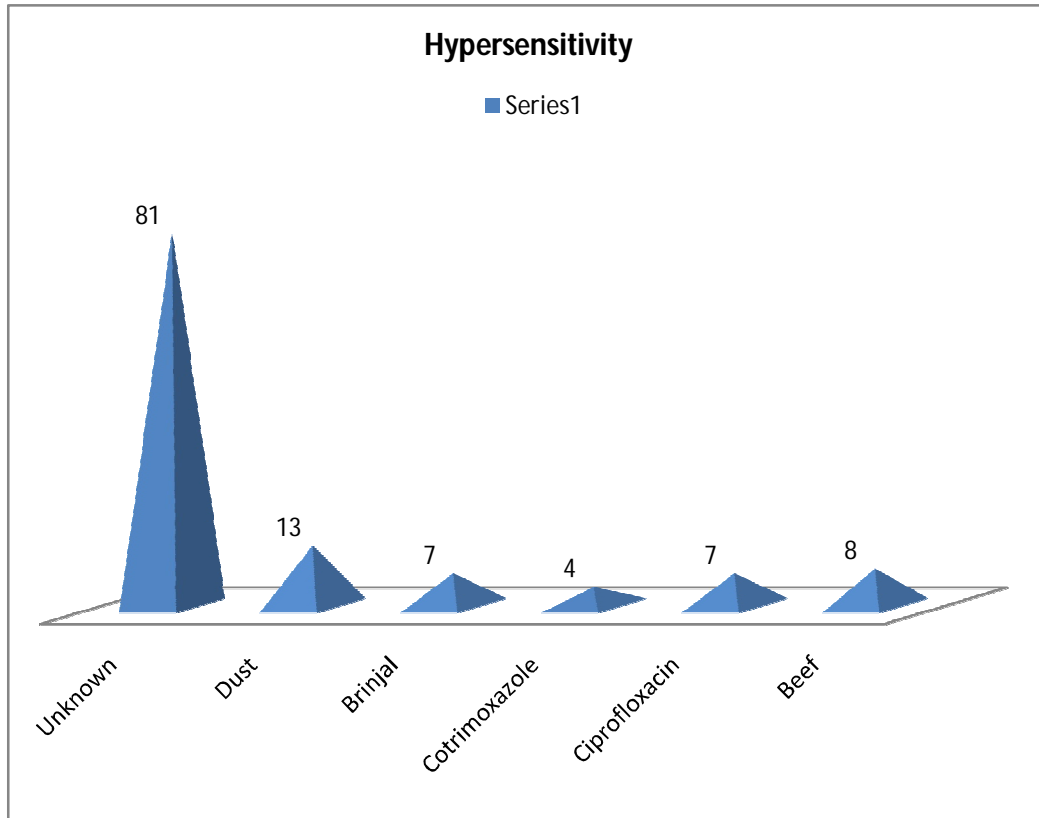
Characteristics:	% of patients suffer & take sedative	% of patients do not suffer and Take sedative
Insomnia	25	75
Take Sedative	100	0

Fig. 18.0: Patients suffering from insomnia and take sedatives.



29.11 Hypersensitivity of Geriatric patients:

Fig. 19.0: Hypersensitivity of patients.



Among 120 target patients 39 patients (32.5%) have known hypersensitivity. The most 13 person is sensitive to dust, 7 person is sensitive to brinjal, 4 person has known sensitivity to ciprofloxacin, 7 person has sensitivity to cotrimoxazole & 8 towards beef.

29.12 Polypharmacy and number of drug prescribed among the Geriatric patients:

Table 8.0: Polypharmacy and number of drug prescribed among the Geriatric patients(n=24):

Number of drugs	Number of patients receiving	%of patients receiving
Less than 5	13	10.8%
5 and more than 5	107	89.16%

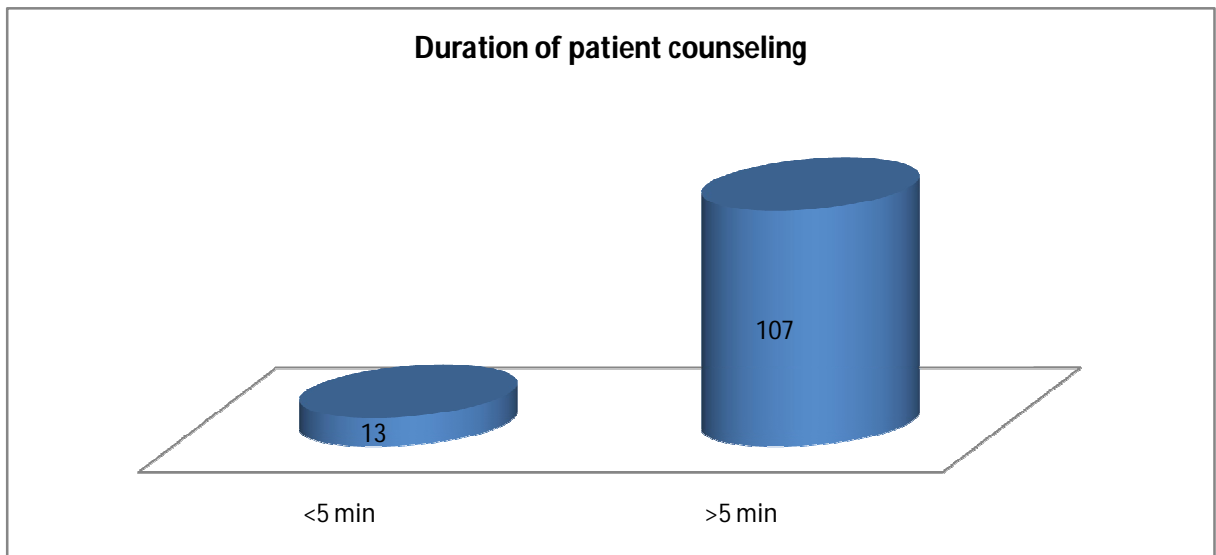
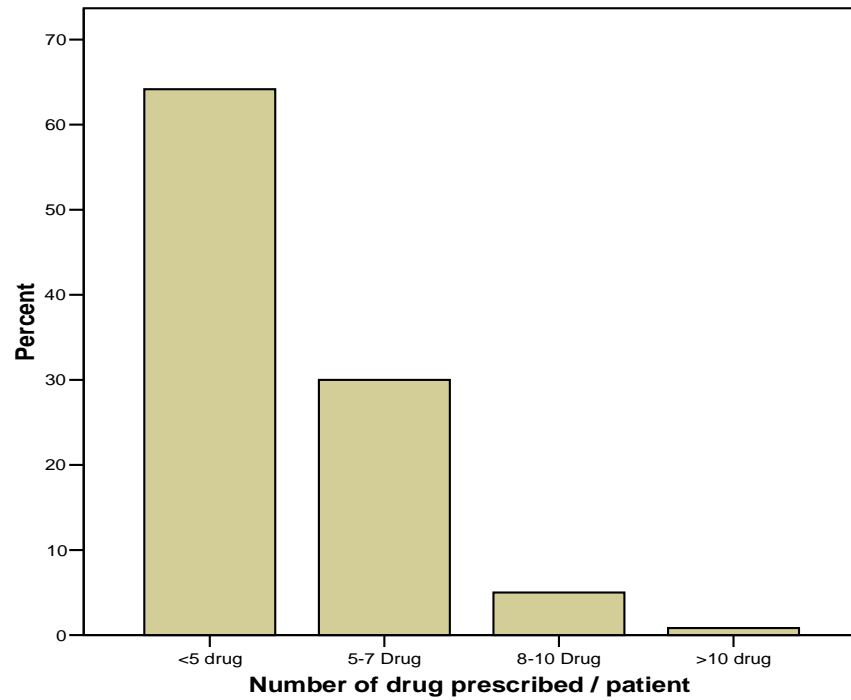


Fig. 20.0: Duration of patient counseling.

Fig. 21.0: Number of drug prescribed per patient.

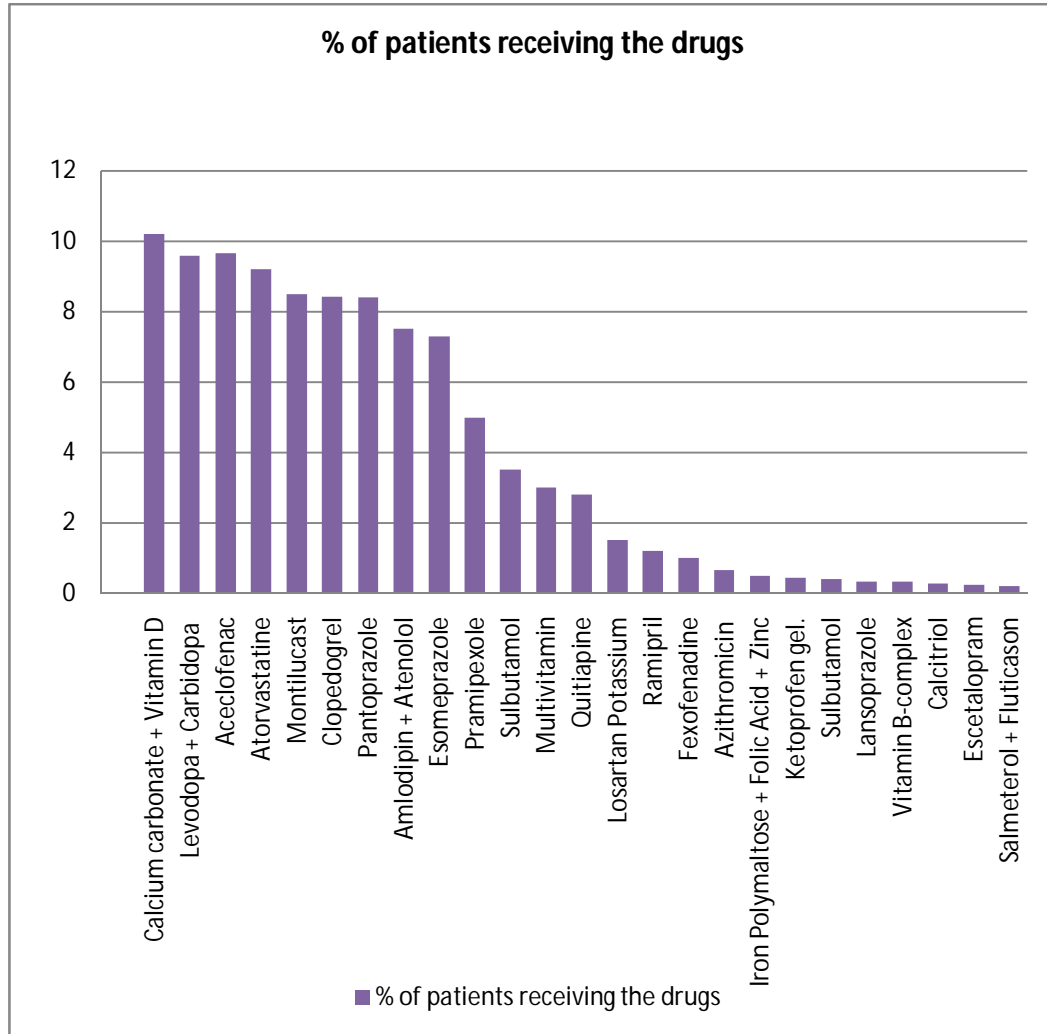


The minimum number of drugs prescribed is 1 and the maximum number of drugs prescribed is 12. The average number of drug prescribed is 4.30 slightly less than polypharmacy. But polypharmacy is observed in 35.83% of total patients, among them 84% of patients were prescribed with 5-7 drugs, 14.0% of patient received 8-10 medecins & 2.32% of patients were prescribed more than 10 drugs. The maximum number of 12 drugs are received by 0.84% patients. Among the total patients 6.67% patients receive single drug.

29.12 Prescribed drugs for the geriatric patients(n=120):

Table 9.0: Top 25 commonly prescribed drugs for the geriatric patients:

No.	Drug	% of patients receiving the drugs
1	Calcium carbonate + Vitamin D	10.19
2	Levodopa + Carbidopa	9.60
3	Aceclofenac	9.66
4	Atorvastatine	9.20
5	Montilucast	8.50
6	Clopedogrel	8.43
7	Pantoprazole	8.40
8	Amlodipin + Atenolol	7.50
9	Esomeprazole	7.30
10	Pramipexole	5.00
11	Sulbutamol	3.50
12	Multivitamin	3.00
13	Quitiapine	2.80
14	Losartan Potassium	1.50
15	Ramipril	1.20
16	Fexofenadine	1.00
17	Azithromicin	0.66
18	Iron Polymaltose + Folic Acid + Zinc	0.50
19	Ketoprofen gel.	0.45
20	Sulbutamol	0.40
21	Lansoprazole	0.33
22	Vitamin B-complex	0.33
23	Calcitriol	0.29
24	Escetalopram	0.25

Fig. 22. % of patients receiving the drug.

The most commonly prescribed drug is the combination Calcium carbonate and vitamin D about 10.19% of patients receiving this drug. Among the other most commonly prescribed drugs combination of levodopa & Carbidopa , Aceclofenac, Atorvastatine, Montilucast, Clopedogrel, Pantoprazole, combination of Amlodipin & Atenolol, Esomeprazole, Pramipexole, Sulbutamol, Multivitamin, Quitiapine, Losartan Potassium & Ramipril are also present.

Table 10.0: Prescribed Antibiotics drugs for geriatric patients (n=120)

No.	Drug	% of patients receiving the drugs
1	Azithromycin	9.16
2	Levofloxacin	5.88
3	Cefuroxime	3.54
4	Cefradine	2.66
5	Cefixim	1.88
6.	Gemifloxacin	1.04

Among 120 target patients 29 patients receive antibiotics, most of them (9.16%) received Azithromycin and & only 10.4% of patient received Gemiflox. Physicians also prescribed Levofloxacin, Cefuroxime, cefradine & cefixime as well.

30.0 Summary of results:

This chapter presented the findings of the analysis. The results found that the percent prevalence of polypharmacy among the study sample of the two hospitals 35.83%. the average number of medications used by geriatric patients of the study sample was 4.30 slightly less than polypharmacy. The minimum number of drugs prescribed is 1 and the maximum number of drugs prescribed is 12. The maximum number of 12 prescribed drugs are received by 0.84% patients. Among the total patients 6.66% patients receive single drug. 30% of patients received 5-7 medicine & 5% off patients received 8-10 drugs.

The most commonly prescribed drug is the combination Calcium carbonate and vitamin D about 10.19% of patients receiving this drug. Among the other most commonly prescribed drugs combination of levodopa & Carbidopa , Aceclofenac, Atorvastatine, Montilucast, Clopedogrel, Pantoprazole, combination of Amlodipin & Atenolol, Esomeprazole, Pramipexole, Sulbutamol, Multivitamin, Quitiapine, Losartan Potassium & Ramipril are also present.

The total 120 patients of above 60 years were examined. Among 120 patients 75 Male (62.5 %) and 45 Female (37.5). Among 120 patients only 1.66% patients are above 100 years of age. Maximum 49.16% of patients are within the range of 60 and 69. There are no female patients above 100 years of age.

The most 25.0% of diagnosis neurological, 20.0% of patients are suffering from cardiac, respiratory & skeletal disorders. Approximately 9% of patients are diagnosed with gastrointestinal disorders & current diagnosis of less than 5% of target patients are Hepatic, reproductive, dental, lymphatic & hematological. None of the patients are diagnosed with renal, dermatological, muscular & endocrine disorders.

The most 26% of patients chief complains are respiratory & skeletal , 18.5% of geriatric patients have neurological complains, 17.0% of patients complains are associated with cardiac disorders & below %% of patients are complaining about gastrointestinal, hepatic, reproductive, lymphatic, hematological & dental Disorders. None of the target patients complained about renal, dermatological, muscular & endocrine disorders.

31.0 Discussion

Polypharmacy commonly is defined as the concomitant ingestion of 5 or more medications, especially in the ambulatory setting. Alternately, polypharmacy may simply describe the “prescription, administration, or use of more medications than are clinically indicated in a given patient.” It is important to note that the number of medications itself does not constitute polypharmacy; rather, using medications that are not indicated or duplicative therapy with unclear need do require additional evaluation.

The average number of drug prescribed during study is 4.30. among the total patients 6.66% receives single drug. Of the outdoor patients, 10.19% received combination of calcium carbonate & vitamin D, making it most frequently prescribed drug during the study. as in the earlier study. For the patients with respiratory diseases most frequently prescribed drug was Montilucast 8.50%. Followed by patients of cardiovascular diseases frequently prescribed drugs were Atorvastatine 9.20%, clopidogrel 8.43% and Combination of Atenolol & Amlodipine 7.5%. About 24.16% of the patients were prescribed antibiotics and the drugs were Azithromycin 9.16%, Levofloxacin 5.88%, Cefuroxime 3.54%, Cephhradine 2.66%, Cefexime 1.88% and Gemifloxacin 1.04% The average number of drug prescribed is 4.30 slightly less than polypharmacy. But polypharmacy is observed in 35.83% of total patients. among them 84% of patients were prescribed with 5-7 drugs, 14.0% of patient received 8-10 medecins & 2.32% of patients were prescribed more than 10 drugs. The maximum number of 12 drugs are received by 0.84% patients. Among the total patients 6.67% patients receive single drug. The most common complaints of geriatric patients are chest pain and 60% patients suffered from this. Joint pain and muscle pain are 54% and 50% respectively among the geriatric patients. 10.84% of geriatric patients were being counseled for less than 5 min & 89.16% of patients were counseled for more than 5 minutes.

Among 120 target patients 39 patients (32.5%) have known hypersensitivity. The most 13 person is sensitive to dust, 7 person is sensitive to brinjal , 4 person has known sensitivity to ciprofloxacin, 7 person has sensitivity to cotrimoxazole & 8 towards beef. None of the physician prescribed such a drug to which patients are hypersensitive.

32.0 Conclusion

At the end of the study we can conclude as polypharmacy was highly predominant in patients over 60 years of age among the geriatric outdoor patients. According to our findings, polypharmacy itself is not a major risk factor for ADRs. More important was the quality of prescribing: overdosing, prescribing of wrong drug by ignoring the drug-drug interaction is one of the main reasons for adverse drug events. Appropriate prescription by considering the rational use of drug is the ultimate solution to improve the drug safety of elderly patients. It was quite tough to figure out certain relationships with polypharmacy e.g. prescribing error, dispensing error, administration error, drug-drug interaction, ADR, nonadherence with prescription, believes etc.

The sample size of the current study is insufficient. Further large scale study will cover more hospital & patients as well. Moreover, at the end of this phase we can conclude by saying that there are many scopes to improve the prescribing practices for geriatric patients. In future I will extend this study in a more precise way if I get opportunity.

33.0 References

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Appendix

Questionnaire:

Prescribing Practice for geriatric patients in the hospitals

Date: dd - mm - yyyy

Hospital Code: AHD (Apollo Hospitals Dhaka)/ UHL (United Hospital Ltd.)

A) Name:		B) age:		C) SEX: 1. <input type="checkbox"/> M 2. <input type="checkbox"/> F		
D) What is your occupation? 1. <input type="checkbox"/> Service 2. <input type="checkbox"/> Business 3. <input type="checkbox"/> Retired 4. <input type="checkbox"/> House Wife						
E) What is the monthly income of your family? BDT			F) How many family members? :			
G) Which type of diseases are you suffering from? No.: _____		1. Diabetes	2. Hypertension	3. Cardiac Arrhythmia		
		4. Atherosclerosis	5. joint pain	6. COPD		
		7. GERD	8. RTI	9. Liver Disease	10. Renal	
		11. Neurological Disorder		12. colon disease	13. Dental	
		14. Hematological	15. Reproductive	16. Tuberculosis		
H) Current medications or medicine recently taken? I) No. of Drug prescribed in Generic name: _____ of _____ J) No. of Anti-biotic prescribed: _____ . K) No. of Injectable prescribed: _____ . L) Total No. of drug prescribed: _____		Brand / Generic name (as prescribed)			Dose	
M) What is your chief complain? _____		1. Cardiac	2. Respiratory	3. Neurological.	4. Gastrointestinal.	
		5. Hepatic	6. Renal	7. Dermatological.	8. Skeletal.	
		9. Muscular	10. Reproductive	11. Endocrine	12. Lymphatic	
		13. Dental		14. Hematological		15. others
N) Current diagnosis: _____		1. Cardiac	2. Respiratory	3. Neurological.	4. Gastrointestinal.	
		5. Hepatic	6. Renal	7. Dermatological.	8. Skeletal.	
		9. Muscular	10. Reproductive	11. Endocrine	12. Lymphatic	
		13. Dental		14. Hematological		15. others
O) Do you visit your Doctor regularly? 1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No		P) Do you have insomnia? 1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No				
Q) you follow the doctor's prescription? 1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No			R) Stress in life? 1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No			
S) Do you take any sedative? 1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No			T) If yes, then which drug: _____			
U) Hypersensitive to : _____			V) Do you take regular physical exercise? 1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No			
W) Are you a smoker 1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No		3. <input type="checkbox"/> Quit Smoking		x) take betel leaves: 1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No		
Y) Take any multi-vitamin? 1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No		Z) Duration of patient counseling? _____ min				