Estimation of Cost and Utilisation of Anti-Diabetic Drugs in Geriatric Patients

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Abstract

This study was designed to analyse the cost and utilisation of anti-diabetic drugs prescribed for the diabetic patients. This prospective observational study was carried out in the Medicine ward of Rajah Muthiah Medical College and Hospital, Annamalai University. The study included 30 hospitalised diabetic geriatric patients of both sex. Demographic data, medical and medication history were collected from the patient's case sheet and analysed for the cost of anti-diabetic drugs prescribed. The study included 56.67 % (n=17) males and 43.33 % (n=13) females 60 years old and above. Most male diabetic patients were in the age group of 65-70 years and females were in the age group of 60-65 years. Systemic hypertension was the major coexisting disorder in the study. About 96.66% of prescription contain Tab. Metformin 500 mg (cost per unit: INR 0.82), 80% of prescription contain Inj. Plain Insulin (cost per unit: INR 169.04), 76.66% of prescription contain Inj. Actrapid (cost per unit: INR 169), 56.66% of prescription contain Tab. Glimipride 1 mg (cost per unit: INR 1.92), 43.33 % of prescription contain Inj. Lente Insulin (cost per unit: INR 96.63) and 26.66 % of prescription contain inj. Mixtard Insulin (cost per unit: INR 169). Out of four Insulin injections, Inj. Actrapid was used in larger quantity (558 units) followed by Inj. Mixtard Insulin (194 units). Out of two tablets, Tab. Metformin was used in larger quantity (47 units). The study concludes that the cost associated with diabetes is enormous. Insulin treatment has substantial impact on the direct medical costs of diabetes mellitus.

Introduction

Definition

Diabetes Mellitus is the metabolic disorder of multiple aetiology characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism, resulting from defects in insulin secretion, insulin action or both (WHO/NCD/NCS/99.2; National Diabetic Group 1979).

Epidemiology

India leads the world with largest number of diabetic subjects earning the dubious distinction of being termed as the "diabetic capital of the world". According to the diabetes atlas 2006 published by the international diabetic federation, the number of people with diabetic in India in around 40.9 million and is expected to raise 69.9 million by 2025 unless urgent steps taken (Mohan et al.,2007)

Diabetes Mellitus, long considered a disease of minor significance in world health, is now taking its place as one of the main threats to human health. The past two decades have seen an explosive increase in the number of people diagnosed with diabetes worldwide (Zimmet, Alberti, & Shaw, 2001). Recent economic change, reflected by rapid industrialization, urbanization and increased wealth at both national and household levels, has led to an increasing proportion of the Thai population living with diabetes. According to the cross country survey in the InterAsia study, the prevalence of type 2 diabetes in Thailand was 9.8%, which was doubling the number forecast by the WHO (Aekplakorn, Stolk, Neal, Suriyawongpaisal, Chongsuvivatwong, & Cheepudomwit, 2003). The hospitalization rate for diabetes in Thailand had shown a rising trend over the years, from 33.3 per 100,000 population in 1985 to 91.0 in 1994 to 380.7 in 2003 and 586.8 in 2006. Hence, Thailand is inevitably moving towards the burden of such a public health problem (Ministry of Public Health Thailand, 2009).

People with diabetes are prone to consequences in both short-term and long-term complications. The chronic nature of diabetes and its devastating complications make it a very costly disease. In the United States, the total estimated cost of diabetes in 2007 was USD 174 billion (American Diabetes Association, 2008). In Latin America and the Caribbean,

total annual cost associated with diabetes was estimated as USD 65,216 million in 2000 (Barcelo´, Aedo, Rajpathak, & Robles, 2003). In Thailand, there also exist some studies on cost of diabetes. A study based on four government hospitals in Thailand found that for outpatients, annual direct medical expenditure was more than five times higher for diabetic patients as compared to non-diabetics and for inpatients, the expenditure was more than two times higher in 2002-03 (Pongcharoensuk, Kongsaktrakool, Tantivipanuwong, Sema-ngern K, & Chaiyakunapruk, 2006). Riewpaiboon et al. (2007) estimated cost of diabetes at a district public hospital in Thailand and found that the direct medical cost was 6,331 baht per person per year in 2001 (Riewpaiboon, Pornlertwadee, & Pongsawat, 2007). However, all those studies estimated the cost from provider perspective, hence, reported only the direct medical cost of diabetes. In order to gather a comprehensive idea on economic burden of diabetes in 3Thailand, the present study aimed to estimate the cost of illness of diabetes from societal perspective. As per the researcher's knowledge, this study was the first attempt to explore the cost of illness of diabetes from societal perspective in Thailand.

Costs

Cost of illness estimates using a prevalence based approach indicate the economic burden of the disease at a given point of time – for the present study the time frame was the financial year 2008 (1stOctober 2007 – 30th September 2008). In this study the cost components consisted of both direct and indirect costs. The direct economic costs reflected the resources used in treating or coping with the disease, including expenditures for medical care and the treatment of illness. Direct cost had been divided into two sub categories – (a) direct medical costs which included costs of hospitalization, outpatient visits, drug, laboratory tests, materials, emergency services (such as dressing for diabetic patients), dental services and traditional medicine services (e.g. foot massage for diabetic patients who had absence of foot pulse) and (b) direct non-medical costs. Direct non-medical costs included cost of transportation to the health care providers, time loss of the patient and the accompanied person for visiting the health care providers, costs of meal and accommodation during these 5visits, costs of personal facilities needed (e.g. home modifications, personal devices) and

cost of informal care. In this study, indirect cost included the societal cost of morbidity, permanent disability and premature mortality.

Methods of cost calculation

Direct Cost

The direct medical cost was calculated by multiplying the quantity of medical services consumed by their unit costs. The study participants received treatment from Waritchaphum hospital, from nine health centres under the hospital and the severe patients received treatment from the provincial hospital as well. Some patients also received treatment from other health care providers such as private clinics, hence, direct medical costs were calculated for all health care services availed by the study participants. Standard costing method was used to calculate the unit cost of medical services at Waritchaphum hospital (Brouwer et al., 2001).

For calculating the cost per visit at the health centres (there were no inpatient services at the health centres) the study result of Kongsawat (1999) was used which calculated the unit cost of services provided at the health care settings in 5 provinces of Thailand during the financial year 1997 under the health system reform project in the Ministry of Public Health (Kongsawatt, 1997). The outpatient visit and inpatient day cost at the provincial hospital was calculated on the basis of approximate average of the results of four studies conducted in different provincial hospitals in Thailand (Jawrakate, 2001; Koopitakkajorn, 2009; Pattanaphesaj, 2008; Tisayaticom, 2000). All costs were converted into 2008 price by using consumer price index for medical care of Thailand. For the drug and laboratory cost per visit at the provincial hospital, the same costs incurred at Waritchaphum hospital were used on the assumption that the drug and laboratory cost per visit will almost be the same at district and provincial hospital.

Indirect Cost

In this study the indirect costs associated with diabetes included health related days absent from work and / or normal activities, leisure time loss, lost earning capacity from permanent6disability and lost productivity from premature mortality. Human capital approach was used for indirect cost calculation (Pritchard & Sculpher, 2000). For calculating the work absence / normal activity lost days, the number of such lost days mentioned by the study participants during last three months from the date of interview was taken into account (following the maximum allowable recall period of 3 months) and then extrapolated the same for the whole year (Kobelt, 2002). Those lost days mentioned by the patients were excluding hospitalization days, hence total hospitalization days during the study period were added to get a complete picture of work absence / normal activity lost days of the study participants. For estimating the mortality cost, the number of death cases occurred among the study participants during the study period was considered and for permanent disability, the patients who reported during interview that they were out of the labour force because of disability were considered. Their Barthel index score (a simple index of independence useful in scoring improvement in the rehabilitation of the chronically ill) also confirmed their severity of disability. For calculating loss of productive life in both deceased and permanent disabled persons, the age of 60 years was considered (the official retirement age in Thailand).

For calculating indirect cost and cost of time loss of the study participants, accompanied persons and informal caregivers, the official minimum wage rate of Sakhon Nakhon Province (148 baht per day) was used in order to average out the differences in earning power of the study participants (Ministry of Labour, 2009). As most of the study participants were agriculturists, they didn't have regular income. Further, some of them must earned more than the minimum official wage while some others earned less than that, hence, using minimum wage was found appropriate. When a person in the active labour force dies or is out of the labour force because of permanent disability, his contribution to the country's Gross Domestic Product (GDP) is lost. Hence, a sensitivity analysis was conducted by using GDP per capita in mortality and permanent disability cost calculation in order to capture how the assumption of using minimum wage rate affected total cost of illness of diabetes.

A constant 5% growth rate in the minimum wage rate was used to calculate income in the future years, this was the average percentage increase in minimum wage in Sakhon Nakhon 7province for last 5 years. The projected GDP growth rate was used from the International Monetary Fund's World Economic Outlook, 2008 report for Thailand. A 3% discount rate was used to convert future earnings to current value. However, this discount rate was varied to 0% and 6% to see the effect on cost (Edejer, Baltussen, Adam, Hutubessy, Acharya, Evans et al., 2003).

According to the WHO estimates, India had 32 million diabetic subjects in the year 2000 and this number would increase to 80 million by the year 2030. Diabetes has become a major health problem in India. Recent studies have shown that healthcare expenditures are as much as five times as high for individuals with diabetes compared to individuals without diabetes.

Objectives of Study

1. To calculate the cost of prescribed anti- diabetic drugs.
2. To analysis the usage of anti -diabetic drugs.
3. To find out the most utilised anti-diabetic drugs.

Plan of Work

- Literature review on cost study on diabetic drugs.
- To prepare a proforma for collection of information from physicians, patients & case sheet.
- To evaluate & analyze the collected information with help of data format.
- To calculate the cost of prescribed anti-diabetic drugs
- Data analysis & interpretation of the results
- Preparation & submission of report

Methodology

Study Site

The study was carried in the Medicine ward of Rajah Muthiah Medical College Hospital, Annamalai University, and a multi specialty 1625 bedded tertiary care teaching hospital

Study Design

Prospective Observational study method. Total 30 geriatric patients enrolled in the study, Data collection form was designed to collect patient's information during hospitalization.

Inclusive Criteria

Only admitted diabetic patients (inpatients) in the medicine ward were included in the study

Exclusive Criteria

Outpatients were excluded from study, pregnant women also excluded

Procedure

Collection of data → Analysis → Result and discussion → Conclusion

Observations and Results

Total of 30 diabetes mellitus patients were collected in the study. The following parameters were analyzed in the study.

Table – 1 Gender distribution of patients

Gender	No. Of patients	% distribution
Male	17	56.66%
Female	13	43.33%

Fig. 1: Graph represents the data from Table- 1

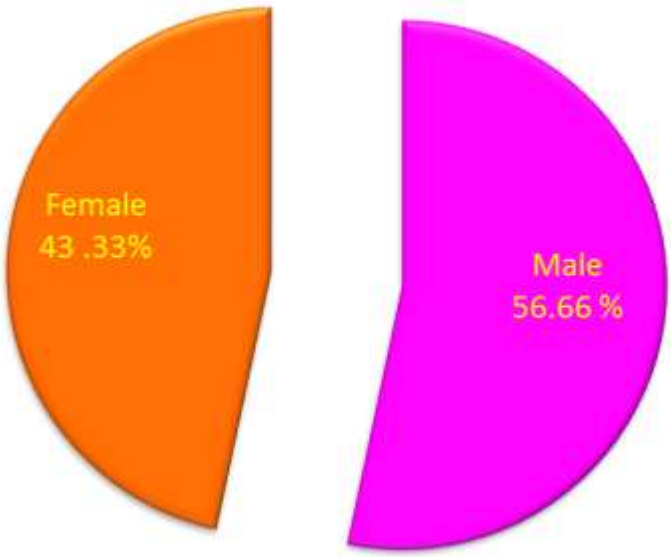


Table -2: Blood sugar level (Random, Fasting and Post Prandial)

SL.No	Blood sugar level (mg/dl)	Total No. Of patients	% (percentage)
1.	RBS(140-200mg/dl) (155-197)	13	43.33%
2.	FBS(140-200mg/dl) (170-200)	10	33.33%
3.	PPBS(120-140mg/dl) (121-137)	7	23.33%

Fig. 2: Graph represents the data from table-3

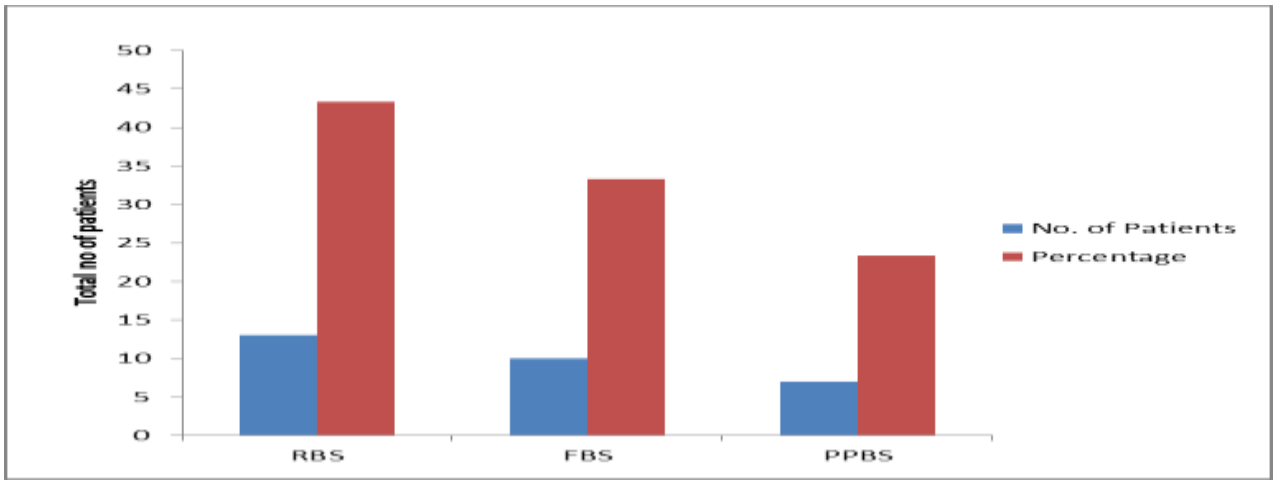


Table- 3: Diabetes mellitus patients with co-morbidities

SL.NO	Associate diseases	Total No. of patients	% (percentage)
1.	Systemic hypertension	5	16.66%
2.	Tuberculosis	4	13.33%
3.	Alcoholic liver diseases	4	13.33%
4.	Persistent hypertension	2	6.66%
5.	Anaemia	2	6.66%
6.	Transverse Myelitis	3	10%
7.	Ischemic DCM	1	3.33%
8.	Anterio Lateral	1	3.33%
9.	Chronic Kidney disease	2	6.66%
10.	Bronchial Asthma	2	6.66%
11.	Myocardial Infraction	1	3.33%
12.	Unstable Angina	1	3.33%
13.	Coronary heart disease Failure	2	6.66%

Fig. 3 Graph represents the data from Table 3

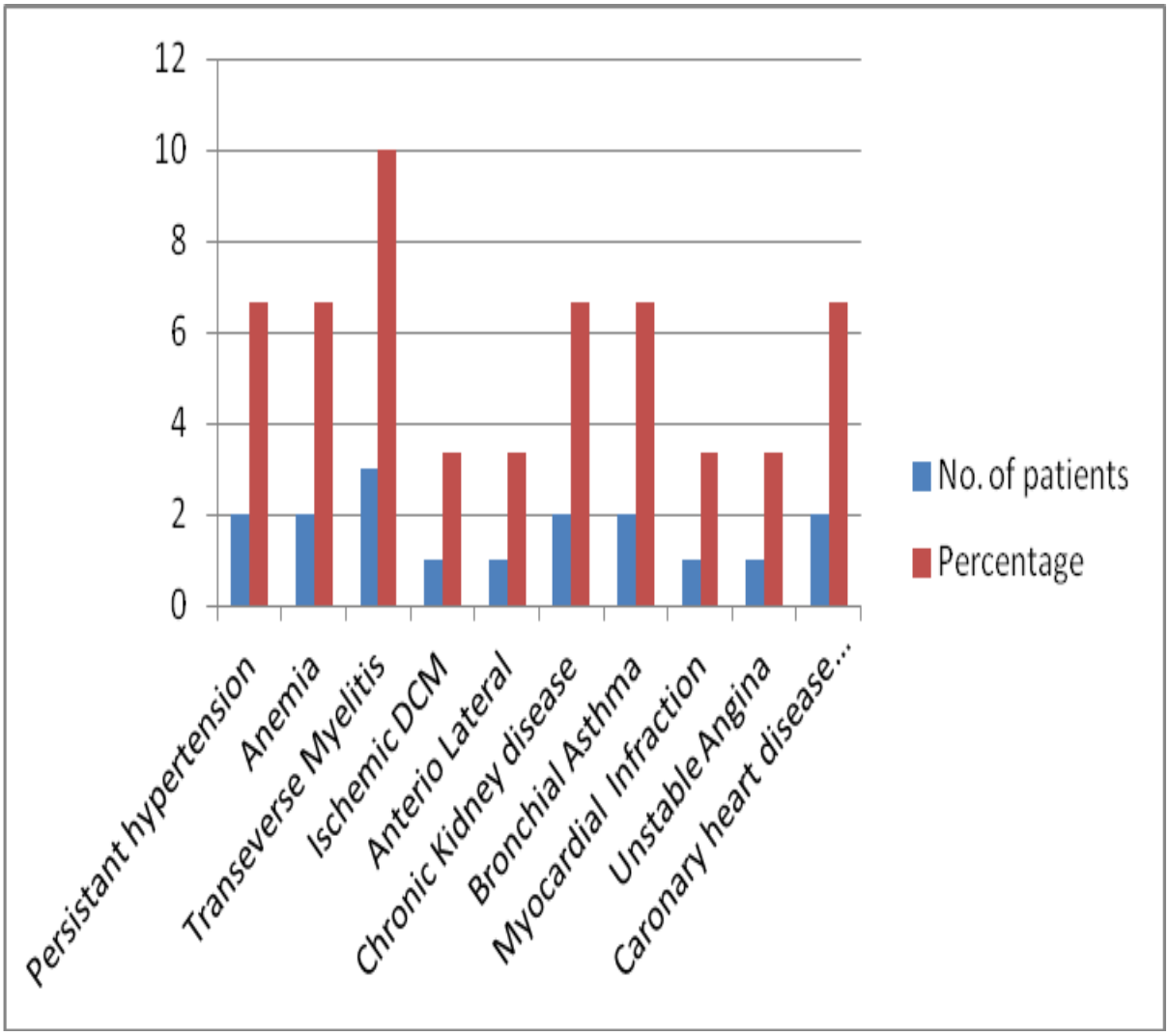


Table – 4 : Anti-Diabetic Prescribed Drugs

SL.No	Drugs	Total No.of patients	% (percentage)
1.	Inj.plain insulin	24	80%
2.	Inj.Lente insulin	13	43.33%
3.	Tab.Metformin 500mg	29	96.66%
4 .	Tab.Glimipride 1mg	17	56.66%
5.	Inj.Actrapid	23	76.66%
6.	Inj.Mixtard insulin	8	26.66%

Fig. 4: Graph represents the data from Table-4

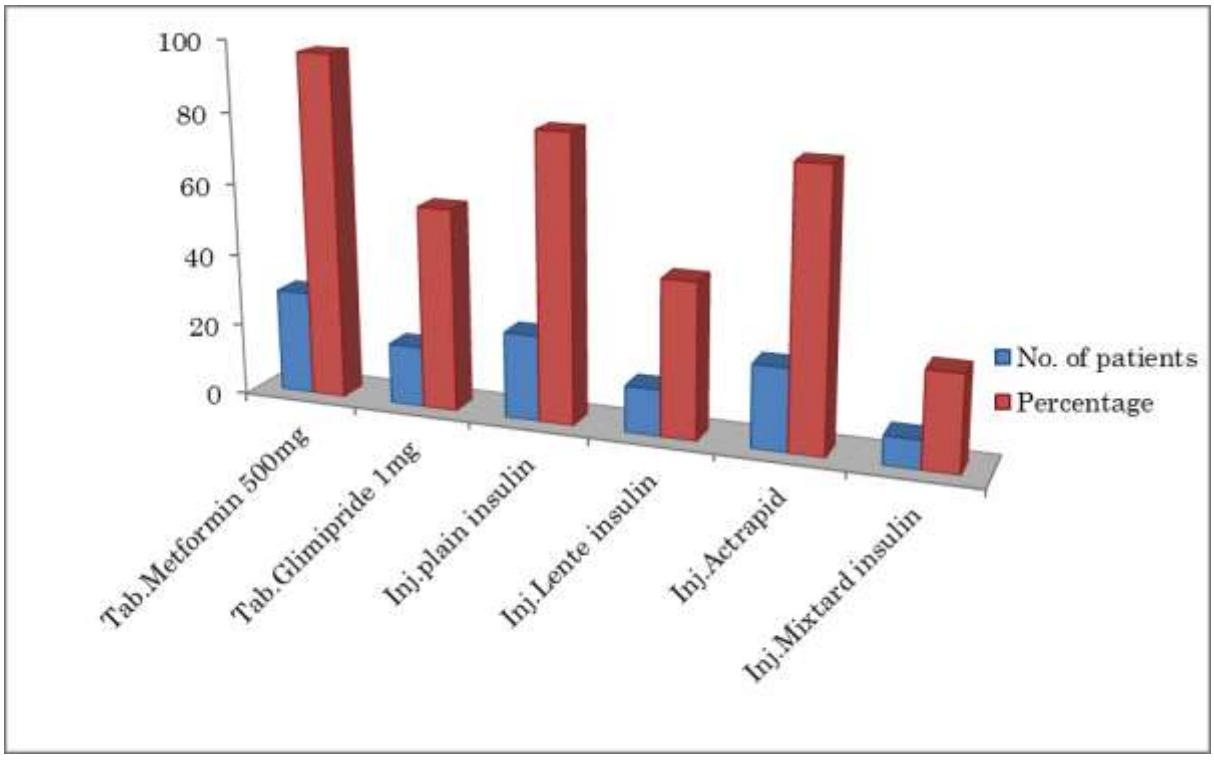


Table- 5: Cost of Prescribed Drugs

S. No	Drugs Prescribed	Unit	Rate	Cost
1.	Tab. Metformin 500mg	47	0.82	38.54
2.	Tab. Glimipride 2mg	32	1.92	61.44
3.	Inj. Plain Insulin 40/iu	166	169.04	280.60
4.	Inj. Lente Insulin 40/iu	110	96.63	105.60
5.	Inj. Mixtard Insulin 3-70mg	194	169	327.86
6.	Inj. Actrapid	558	169	943.02

Fig. 5: Graph represents the data from Table-5

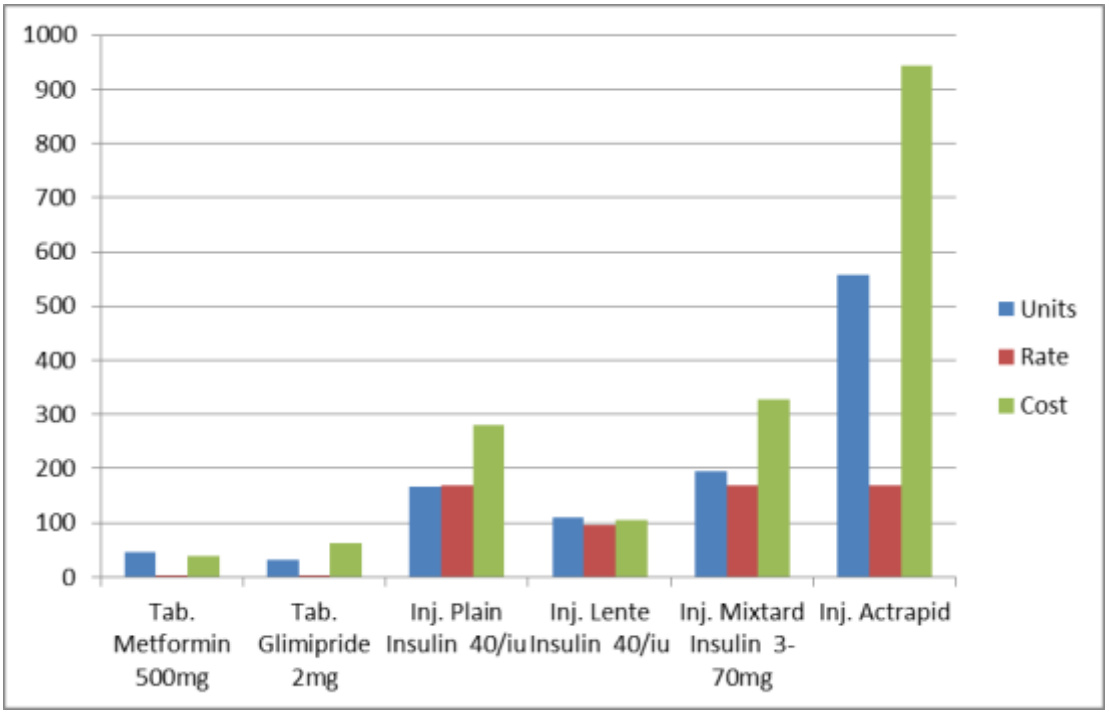
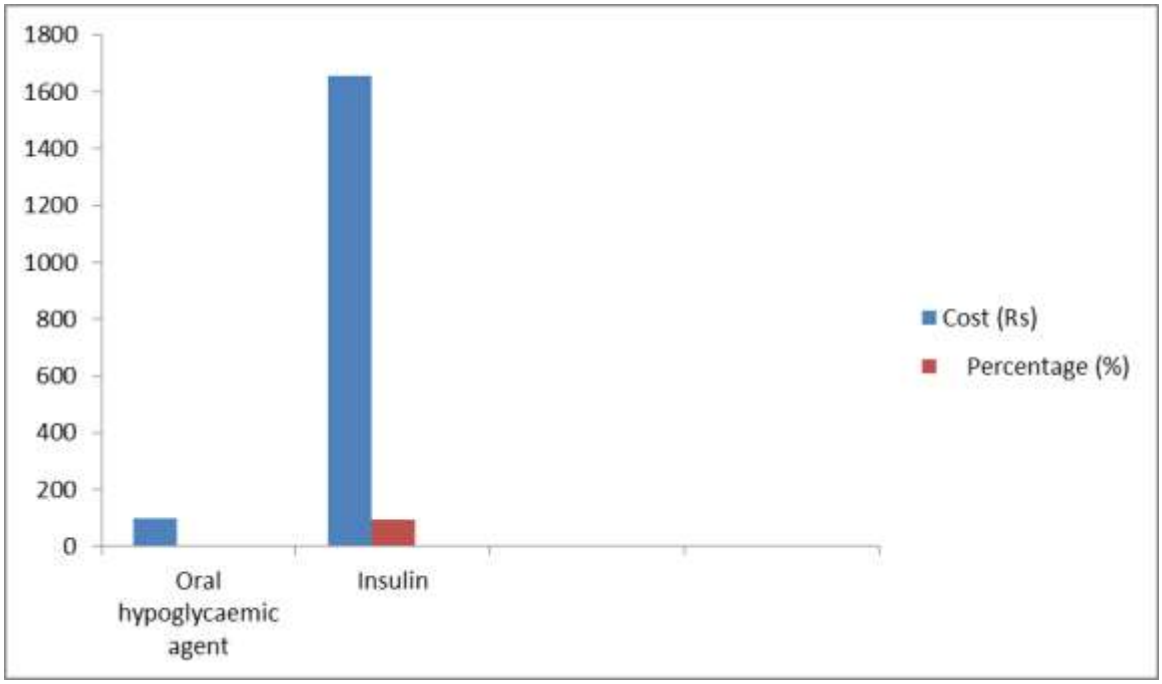


Table-6: Cost distribution of Anti-diabetic drugs prescribed

Sl.No	Drugs	Cost (Rs)	Percentage (%)
1	Oral hypoglycaemic Agents	99.98	5.70
2	Insulin	1657.02	94.30

Fig. 6: Graph represents the data from Table - 6



Discussion

Age Distribution

The age distribution is diabetic mellitus cover assessed that most male diabetic patients were in the age group of 65-70 years and females were in the age group of 60-65 years.

Gender distribution

Majority of patients under study belonged to male group (n=17).Female patients were less in no (n=13).

Diabetic's Mellitus with co-Morbidities

Most common disease associated with diabetics mellitus was found to be systemic hypertension (n=5) followed by alcoholic liver diseases (n=4) other diseases associated as TB, chronic kidney disease, Transverse myelitis.

Adverse Drug Reactions

Adverse drug reaction is any undesirable affect of a drug beyond its anticipated therapeutic affects occurring during clinical use. Most common adverse drug reaction was found to be Vomiting (13.3%) ,Giddiness(10%) other are nausea

Cost of Therapy

The maximum cost of therapy per day was found to be Rs.150 to 300.

Conclusion

Out of four Insulin injections, Inj. Actrapid was used in larger quantity (558 units) followed by Inj.Mixtard insulin (194 units). Out of two tablets, tab.Metformin was used in larger quantity (47 units). The study concludes that the cost associated with diabetic is enormous. Insulin treatment has substantial impact on the direct medical costs of diabetic mellitus. Routine measurement of economic and quality of life outcomes alongside clinical

outcomes will become necessary for assessing the total value that new anti diabetic medications provide and whether cost offsets to managed care exist.

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References

Arenas-Guzam R, Tosti A, Hay R, Pharmacoeconomics- an aid for better decision making, JEADV, 2005,19 (suppl. 1): 34- 39

Dr. Susmita Chattopadhyay , Cost of Illness of Diabetes Mellitus in Thailand Economist, National Institute of Cholera and Enteric Diseases, Kolkata, India.

Lyses A, Recent trends in Pharmacoeconomics: Needs and unmet needs. European Journal of Pharmaceutical sciences 2008; 34 : S 7- S 24

Roger Walker, Cate Whittlesea, Clinical Pharmacy and Therapeutics 4th Ed. Pages 637 – 644.

Tayler D,Knapp M, Kerwin R, Pharmacoeconomics in Psychiatry, 1st ed. Martin Duniz Ltd 2002.

Tseng Chin-Hsiao, Taipei, Taiwan, the Costs of Diabetes Pharmacoeconomics, volume 18, September 2000, pages 225-238

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