SHORT COMMUNICATION
PHARMAECOEMONOMICAL EVALUATION OF PRESCRIBING TRENDS AND PRESCRIPTION COST ANALYSIS OF ANTI-DIABETIC DRUGS IN THE UNITED KINGDOM
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ABSTRACT
This study deals with the pharmaco economical evaluation of the prescribing trends and prescription cost analysis of anti-diabetic drugs in UK from 1999–2015. The trend and cost estimation have been performed by the help of prescription cost analysis (PCA) data provided by National Health Service (NHS), UK. In addition to PCA, the trend of prescribing new drugs developed for type-II diabetes has also been studied. A dramatic increase in cost and number of diabetic drugs dispensation has been observed. The total number of diabetic prescriptions from 1999 to 2015 has significantly increased from 1,01,70,700 to 4,17,92,000 while the rise in total cost during the same period is found to be from £13,66,13,200 to £74,71,36,500. The largest proportion of cost was spent on insulin until 2013 followed by oral hypoglycemic agents, in spite the fact that they were three times more prescribed than insulin. However, in the last two years, the cost of oral hypoglycemics has superseded insulin. Biguanides (metformin) were the highly prescribed drugs among oral hypoglycemics followed by sulfonylureas and thiazolidinones. The relatively two new groups of drugs i.e. glucagon like peptide-1(GLP-1) mimetics and dipeptidyl peptidase (DPP-IV) inhibitors are comparatively more expensive than the conventional anti-diabetic drugs but still a rise in their prescribing has also been noted from the year 2007 and onwards. A decrease in prescribing of alpha glucosidase inhibitors has been observed. It is concluded that the prevalence of diabetes is constantly increasing with the passage of time and it would be a great challenge in future to control it due to aging and high obesity rates in UK.

Keywords: Diabetes, anti-diabetic drugs, prescribing trends, prescription cost analysis.

1. INTRODUCTION
In the year 2000, around 171 million people were reported to have diabetes, and it is predicted that the figure will reach to 366 million in 2030¹². It is estimated that 90% of the diabetics are suffering from type-II diabetes which is associated with the risk of both micro- (retinal diseases, renal diseases, and neuropathy) and macro-vascular complications (coronary heart disease, stroke and peripheral vascular diseases)³⁴. Diabetic patients are 5 times more at risk to heart diseases, 20 times to blindness and 15 times to lower limb amputation⁵⁶. The UK Prospective Diabetes Study (UKPDS) revealed that the intensive control of blood glucose level in people with type-II diabetes significantly reduces the cost of complications⁷. The diabetes control and complications trail research group stated that the benefits of controlling type-I diabetes by intensive therapy reduces the risk of retinopathy by 76% and the risk of developing early renal disease by 54%⁸. Apart from insulin, there are five traditional classes of oral hypoglycemic agents which are currently available for the treatment of type-II diabetes. They include biguanides, sulfonylureas, meglitinides, thiazolidinones, and alpha glucosidase inhibitors⁹¹¹. Incretin mimetics (e.g. exenatide, liraglutide, albiglutide, etc.) are the new class of hypoglycemic agents which enhances the effect of incretin hormones thus causing a reduction in blood glucose level by increasing extra insulin from the pancreatic beta cells¹². The effect of incretins can be elevated by two ways i.e., either by increasing

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the activity of glucagon like peptide-1 (GLP-1) or by decreasing its breakdown through inhibition of dipeptidyl peptidase (DPP-IV). The DPP-IV inhibitors or incretin enhancers (e.g. sitagliptin, vildagliptin, alogliptin, etc.) are also the new class of oral hypoglycemic agents used in the treatment of type-II diabetes. Berberine, a well-known alkaloid, is also known to inhibit DPP-IV and thus possess anti-diabetic activity.

In the current scenario, the world is facing a great health challenge in the form of diabetes which is the 5th leading cause of death apart from other natural causes. The National Health Service (NHS), UK has provided an estimated cost of £10 million per day (i.e. 5% of the total budget) for managing and treating diabetes. This is not only an enormous burden for NHS but the sufferer of diabetes spends around 1.1 million days in hospital per year. NHS in 1991 introduced a system of compiling prescriptions data all over the UK known as prescription cost analysis (PCA). PCA is based on the dispensing of drugs by appliance contractors, community pharmacists and physicians in UK. It includes prescriptions written in England, Scotland, Wales, Northern Ireland and the isle of Man but dispensed in England. It excludes all such prescriptions that are not dispensed in England. The object of this pharmacoeconomic study is to assess the prescribing trend and rise in the cost of anti-diabetic drugs in UK from 1999 to 2015 using PCA data. Moreover, the study also aims to observe any changes in the prescribing trend with respect to the new drug groups such as GLP-1 mimetics and DPP-IV inhibitors used in the treatment of type-II diabetes.

2. METHOD
The project is a descriptive type of research and consists of PCA data analysis from the year 1999–2015. PCA is a system that compiles data on all community prescriptions dispensed in UK and is controlled by NHS, UK. No statistical methods are used in this study as it is a descriptive type of study and the results are analyzed from the PCA data obtained from a reliable source, i.e. NHS, Department of Health, UK.

3. RESULTS AND DISCUSSION
The results indicated that the number of diabetes prescriptions and the cost of medications have dramatically increased in the last 16 years (1999–2015). The total number of diabetes prescriptions have risen from 1,01,70,700 (1999) to 4,17,92,000 (2015) (Fig. 1). Similarly, the total cost has also increased from £13,66,13,200 (1999) to £74,71,36,500 (2015) (Fig. 2).

Fig. 1. Number of diabetic prescriptions dispensed per year from 1999 to 2015.
The largest proportion of cost until 2013 was spent on insulin (£34,29,64,300) followed by other oral hypoglycemic agents (£40,41,72,200) despite the fact that they were three times more prescribed and dispensed than insulin. However, from 2014 a sudden rise in the total cost of oral hypoglycemics has been observed which might be due to the prescribing of newly available expensive drugs. The dispensation of biguanides (metformin) is found to increase significantly with the passage of time which could be attributed to their cost effectiveness and their preference as a first line therapy for the treatment of type-II diabetes. After biguanides, sulfonylureas are found to be the second largest group of drugs dispensed for the treatment of diabetes due to a considerable decrease in their cost in the year 2004 as a result of completion of its patenty. The use of thiazolidinones is also noted in the prescriptions since the year 2000 and is accounted as the third largest prescribed oral hypoglycemic agents after biguanides and sulfonylureas. On the contrary, the use of alpha glucosidase inhibitors (acarbose) has faced a continuous decline from the year 1999 (Fig. 3) due to better options available for the treatment of diabetes.

The prescribing of drugs from the two new groups i.e. GLP-1 and DPP-IV are found to increase from the year 2007 despite being expensive than other hypoglycemic agents. It is expected that once the patency of drugs included in these groups would be finished the cost would become lower. Prescribing of combination therapies has also been observed from the year 2004 (Fig. 3). The first combination noted was for metformin and rosiglitazone but a complete prescribing of this combination stopped from the year 2012 due to increase risk of heart attack (Fig. 3). The combination of metformin with pioglitazone was seen in prescriptions from 2006. Till the year 2015, a decline in the prescribing of this combination has also been noted (Fig. 3).

4. CONCLUSION
The study concluded that the prevalence of diabetes is constantly increasing with the passage of time and is economically a huge burden for the patients or their health insurance companies. The control of diabetes will be a great challenge in future as the increasing prevalence of diabetes will continue because of aging and increase in the rate of obesity.
Fig. 3. Number of diabetic prescriptions for acarbose and metformin combinations dispensed per year from 1999 to 2015.

in UK. A controlled healthy diet, regular walk, exercise, early identification of the disease and better control of blood glucose level are the basic ways to minimize the progression of the disease as well as its complications.

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