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RESEARCH PAPER

MICROCAPSULES AND TRANSDERMAL PATCHES: A COMPARATIVE APPROACH FOR IMPROVED DELIVERY OF ANTIDIABETIC DRUG

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Glibenclamide (GL)-loaded microcapsules (MC) and transdermal patches (TDP) were formulated and *in vitro* and *in vivo* parameters were compared to find out the best route of drug administration. The formulation TDP1 having a drug-polymer ratio 1:1 showed comparatively higher drug release and better permeation across mice skin ($p < 0.05$). From the comparative study, it was concluded that the transdermal system of GL produced better improvement compared to oral microcapsule administration ($p < 0.05$). The transdermal system exhibited comparatively slow and continuous supply of GL at a desired rate to systemic circulation avoiding metabolism, which improved day-to-day glycemic control in diabetic subjects. Transdermal system of GL exhibited better control of hyperglycemia and prolonged plasma half-life by transdermal systems (9.6±1.2 h) in comparison with oral microcapsule (5.84±2.1 h), indicating that the drug, when administered by transdermal systems, will remain in the body for a longer period. From the glucose tolerance test, transdermal route effectively maintained the normoglycemic levels in contrast to the oral group (MC1), which produced remarkable hypoglycemia ranging from -12.6±2.1% to -18±2.3%. The significantly high ($p < 0.05$) area under the curve values observed with transdermal system (1,346.2±92.3 ng ml^{-1} h^{-1}) also indicated increased bioavailability of the drug from these systems compared to the oral route (829.8±76.4 ng ml^{-1} h^{-1}).

Key words: Bioavailability, Glibenclamide, Oral microcapsules, Pharmacokinetics, Transdermal delivery.

INTRODUCTION

In the modern era, diabetes mellitus is one of the major crippling diseases in the world, leading to huge economic loss. Studies conducted in India highlighted that not only the prevalence of diabetes is high but also, it is increasingly rapid in urban population [1]. Groundbreaking drug delivery systems may allow formulation scientists to utilize chemicals that are otherwise difficult to use because of stability, toxicity, or bioavailability problems. Drug administration with specific delivery systems can potentially facilitate the delivery of drugs to the particular site of action while reducing the undesired side effects, thus drastically increasing patient compliance. Nowadays, transdermal patch-type drug delivery systems are used as a new frontier for the administration of various drugs [2-6]. Drugs are delivered directly to the systemic circulation through intact skin, bypassing hepatic "first-pass" metabolism, and provide controlled release of drugs for an extended and safe use [7-19].

Glibenclamide (GL), a sulfonylurea used in the treatment of non-insulin dependent diabetes